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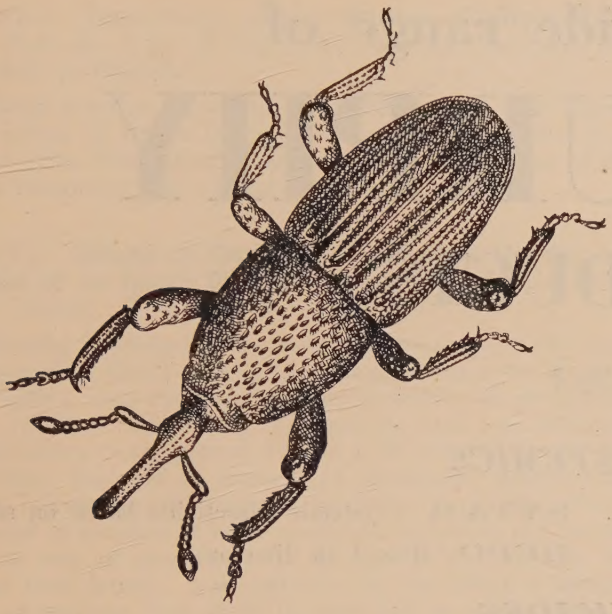

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Düzgüneş (Z.). *Taeniothrips simplex* **Morison (Gladiolus Thrips'i).**—*Bull. Plant Prot.* no. 3 pp. 27–30, 3 figs., 6 refs. [Ankara] 1952. (With a Summary in English.)

Taeniothrips simplex (Morison) was found for the first time in Turkey on *Gladiolus* corms of Dutch origin in a market in Istanbul in March 1952. The author gives brief descriptions of the various stages of this thrips and reviews its bionomics and control from the literature.

Burnett (T.). **Effects of Temperature and Host Density on the Rate of Increase of an Insect Parasite.**—*Amer. Nat.* **85** no. 825 pp. 337–352, 5 figs., 14 refs. New York, N.Y., 1951.

The following is virtually the author's summary. The searching of the Eulophid parasite, *Dahlbominus fuscipennis* (Zett.), for its host, *Neodiprion sertifer* (Geoffr.), was examined in the laboratory at temperatures of 16, 20 and 24°C. [60·8, 68 and 75·2°F.], when the host was uniformly distributed at seven densities ranging from 0·06 to 1·56 cocoons per sq. inch. At lower host densities, the rate of increase of parasitism with density was rapid, but at the higher host densities it tended to level off. Variations in area of search and in number of hosts available for attack did not account for the variation in rate of increase. At 24 and 20°C. the rate of increase, at the highest host density, was controlled by the effect of temperature on the parasite's oviposition, but at 16°C. only half as many hosts were attacked and half as many eggs were laid as was possible. A formula is given expressing the relation between parasitism and host density in a single parasite generation. Increase in temperature and in host density would cause a large increase in the ratio of parasites emerging to hosts emerging in a single parasite generation.

Ludwig (D.) & Wugmeister (M.). **Effects of Starvation on the Blood of Japanese Beetle** (*Popillia japonica* **Newman**) **Larvae.**—*Physiol. Zoöl.* **26** no. 3 pp. 254–259, 1 graph, 23 refs. Chicago, Ill., 1953.

Ludwig (D.) & Bartolotta (A. J.). **The Effect of DDT on the Composition of larval Blood of the Japanese Beetle** (*Popillia japonica* **Newman**).—*J. N. Y. ent. Soc.* **61** no. 3 pp. 119–125, 12 refs. New York, N.Y., 1953.

The results of the investigations recorded in the first of these papers, in which larvae of *Popillia japonica* Newm. were starved for four weeks and their blood was analysed during and at the end of this period, showed that there was no change in protein nitrogen, an increase in non-protein and amino nitrogen, and an increase in reducing compounds. The content of free fat increased during the first fortnight and returned to normal during the second, and water content and osmotic pressure remained constant.

The following is substantially the authors' summary of the second paper. Analyses were made of the blood of normal larvae of *P. japonica* and of others three days after exposure to DDT. This study included determinations of protein, non-protein, amino acid, uric acid, and urea nitrogen, as well as of reducing compounds. There was no change in the protein nitrogen of the blood following DDT poisoning. However, non-protein nitrogen increased from an average of 620 to 967 mg. per 100 ml. Comparable increases in other constituents were: amino acid nitrogen from 241 to 420 mg.; urea nitrogen from 26·6 to 47·3 mg.; reducing compounds from 248 to 314 mg. The uric acid of the blood decreased slightly following exposure to DDT. These results are similar to those determined during starvation, and add evidence to the suggestion that starvation may be a factor causing

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the death of larvae following DDT poisoning [*cf.* also *R.A.E.*, A **37** 188]. Glycogen and glucose appear to be used to a greater extent during DDT poisoning than during complete inanition. However, the utilisation of fat occurs to a much greater degree during four weeks of starvation. This observation suggests the possibility that DDT may interfere with an enzyme required for the utilisation of fat.

Carter (R. H.), Hubanks (P. E.), Poos (F. W.), Moore (L. A.) & Ely (R. E.). **The Toxaphene and Chlordane Content of Milk from Cows receiving these Materials in their Feed.**—*J. Dairy Sci.* **36** no. 11 pp. 1172–1177, 1 graph, 9 refs. Lancaster, Pa., 1953.

The results are given of tests in 1948–50 in which toxaphene and chlordane as residues on lucerne hay and as solutions in soy-bean oil were included in the daily ration of milking cows and milk produced by each animal on two days of each 10-day period was analysed.

The lucerne had been sprayed with 1·5 lb. toxaphene or 1 lb. chlordane per acre in 1948, and the hay bore average residues of 81·8 and 20·4 parts per million, respectively, and was fed for 150 days from 6th December 1948 to 4th May 1949. In 1949, the crop was sprayed with 1·5 lb. toxaphene or 2 lb. chlordane per acre, the hay bore average residues of 31·8 and 20·8 p.p.m., respectively, and it was fed for 100 days from 2nd September to 8th December. The analyses showed that a daily intake of 491–762 mg. toxaphene (1·37–1·7 mg. per kg. body weight) for 150 days resulted in an apparent toxaphene content in the milk of about 0·5 p.p.m., and a daily intake of 163–243 mg. (0·45–0·51 mg. per kg.) for 100 days in 0·1 p.p.m. A daily intake of 118–201 mg. chlordane (0·36–0·42 mg. per kg. body weight) for 150 days resulted in an apparent chlordane content of 0·1–0·2 p.p.m. in the milk, whereas one of 137–162 mg. (0·34–0·43 mg. per kg.) for 100 days did not result in any measurable amount.

At the end of the hay-feeding tests in December 1949, the same cows were fed with technical toxaphene and chlordane in soy-bean oil. A daily intake of 1,000–2,000 mg. toxaphene (2·7–4·4 mg. per kg. body weight) for 45 days resulted in an apparent toxaphene content of less than 1 p.p.m. in the milk, and a daily intake of 5,000 mg. (9·3 mg. per kg.) for 71 days in a maximum apparent content of 3·4 p.p.m. A daily intake of 1,500–2,000 mg. chlordane (3·6 mg. per kg. body weight) for 45 days resulted in an apparent chlordane content of nearly 1 p.p.m. in the milk, and daily intakes of 4,000 and 5,000 mg. (9·8 and 9 mg. per kg.) for 71 days in 8 and 7·3 p.p.m., respectively.

Cairaschi (E. A.). **La lutte contre les hannetons et les vers blancs. Protection des prairies naturelles en France.**—40 pp., 24 figs. Paris, Féd. nat. Prod. Lait, 1951.

The author emphasises the importance of *Melolontha melolontha* (L.) as a pest of grassland and vegetable crops in northern and eastern France, gives a short account of its bionomics [*cf.* *R.A.E.*, A **30** 372; **40** 188; **41** 130] and describes methods of control by means of insecticides. The egg stage lasts 4–6 weeks and the larval stage two years, and the adults pass a further winter in the soil before emerging to the surface, in the third spring after the previous flight. Some adults appear each year, but in any given locality, one of the three broods is much more numerous than the others, and the years of greatest abundance vary in different parts of France [*cf.* **37** 62]. The distribution of the broods and the areas in which flights were heaviest in 1948, 1949 and 1950, respectively, are shown on a map.

Control measures can be carried out either against the adults, while they are feeding and before they oviposit [*cf.* **41** 129–130], or against the larvae in their first year, before they become injurious [*cf.* **37** 63]. Treatment against the adults should be applied if sampling before the beetles leave the soil shows more than 4–5 adults per sq. metre and be timed by the date of leaving the soil. Grassland can tolerate a population of 30 larvae per sq. metre, and hoed crops, nurseries and strawberry beds one of 4–5, during the flight year, and measures against the larvae should be carried out when soil samples during the autumn of this year show numbers in excess of these, though the necessity for control may be modified by the occurrence of mortality due to unfavourable weather or soil conditions, mechanical destruction [*cf.* **30** 372], bacteria, fungi or birds. BHC and derivatives of it, DDT and parathion are recommended for use against the adults, and BHC, its derivatives, and chlordane against the larvae, though BHC should not be used where food crops are to be grown, for fear of affecting their flavour.

Bonnemaison (L.). **Morphologie et biologie de la punaise ornée du chou (*Eurydema ventralis* Kol.).**—*Ann. Épiphyt.* **3** no. 2 pp. 127–272, 109 figs., 7 pp. refs. Paris, 1952.

The author gives detailed descriptions of the morphology of all stages and the internal anatomy of the adults and nymphs of *Eurydema ventrale* Kol. (*ornatum*, auct.), discusses the identity of this Pentatomid and the colour varieties of it that have been recorded, and gives maps showing its distribution. It attacks numerous wild and cultivated crucifers, and observations on its bionomics were carried out in various parts of France in 1936–39 and continued after the war. The following is based on the author's summary of the work described.

The adults overwintered in cracks in the soil or under litter and resumed activity in late March or early April. Pairing took place 5–12 days later and was repeated at frequent intervals through life. Oviposition began at the end of April or beginning of May. Eggs were deposited in batches of 12 on the lower surfaces of the leaves or on the petioles, peduncles or siliquae. Females deposited 5–6 batches each in the field, but one in the laboratory laid 23. The nymphs were gregarious and did not feed in the first instar, but older ones spread over the plants and, like the adults, fed preferably on the edges of leaves exposed to the sun. The way in which the bugs puncture the epidermis and consume the underlying tissue is described at length. Damage to old plants was normally unimportant, but young ones were killed by heavy infestations. The flowers and siliquae were also attacked by the adults in spring, and feeding on them reduced seed yields.

The first-generation adults appeared during the first half of July and were capable of covering considerable distances in search of food-plants. A large number of them sought winter quarters and went into diapause, the proportion doing so varying with locality and weather, and the remainder gave rise to a partial second generation. These were less fertile than the overwintered adults, and their progeny developed more slowly, the numbers of days required for total development at 24 and 20°C. [75·2 and 68°F.] averaging 38 and 58 for the first generation and 44 and 68 for the second, respectively. Diapause was more easily broken in the first generation than in the second. A strain was reared without interruption in the laboratory at a constant temperature of 28°C. [82·4°F.], but diapause occurred in the 11th generation when the third-instar nymphs were exposed to 20°C. for two days, although young adults of the ninth generation exposed for four days to 12°C. [53·6°F.] and for eight days to 4°C. [39·2°F.] reproduced

when restored to 24°C. The stimulus to seek shelter for hibernation was provided by negative phototropism.

Laboratory cultures of *E. ventrale* were attacked on several occasions by a fungus of the genus *Sterigmatocystis*, which was not found in the field. Near Lyons, the adults were parasitised by *Phasia crassipennis* (F.) and the eggs by *Microphanurus semistriatus* (Nees) and *Trissolcus simoni* (Mayr), but little control was afforded. Mortality was high following heavy rain and during the periods of hatching and moulting. Warm, dry springs or summers favoured the development of outbreaks.

Infestation can be prevented or reduced by crop rotation and the destruction of wild crucifers, especially at the end of May when oviposition on them is practically complete; trap-plants can be sown for similar treatment. Hand collection of adults in late April or early May is useful. Several field and laboratory tests were carried out with insecticidal dusts and sprays. In tests of insecticides, a preparation containing 4 per cent. parathion used at 5 lb. per 100 gals. and a 1 per cent. parathion dust gave 95–98 per cent. mortality in the field, and a spray of 0·24 per cent. BHC (15 per cent. γ isomer) gave 70–82 per cent. Dusts and sprays of rotenone and a chlordane dust proved fairly effective in the laboratory, but DDT was very inferior.

Journet (P.). **Contribution à l'étude de la sésie du groseillier.**—*Phytoma* **5** no. 41 pp. 24–25, 1 fig. Paris, 1952.

Aegeria tipuliformis (Cl.) has caused increasing damage to currants in France of recent years, and since little was known of its bionomics, observations were made in 1951–52. Infested material collected at the end of the winter was enclosed with black-currant bushes under a wire-mesh cage, and adult emergence began on 3rd June in 1951 and continued from 21st May to 6th June in 1952. Females confined with males oviposited four days after pairing in 1952, and the eggs, which are described, were mostly laid singly under loose bark scales. The larvae hatched in about eight days at 20°C. [68°F.] and bored into the stems a few hours later, entering at the site of a cut or injury. It is thought that a contact or stomach poison applied against the newly hatched larvae, before they enter the wood, or an ovicide, might give effective control [*cf. R.A.E.*, A **42** 7].

Targe (A.) & Deportes (L.). **L'aleurode des agrumes,** *Dialeurodes citri* **Ash. dans les Alpes-Maritimes. Premiers résultats d'expérimentations de traitements.**—*Phytoma* **6** no. 44 pp. 9–15, 7 figs., 1 map, 2 graphs, 9 refs. Paris, 1953.

Dialeurodes citri (Ril. & How.) was first observed in the Department of Alpes-Maritimes on *Citrus* in 1945–46 and has since spread along the coast from Cannes to Menton, causing considerable damage. Heavy infestations have also occurred on persimmon, privet [*Ligustrum*], lilac, *Gardenia*, *Forsythia* and *Melia*. Fig was lightly infested. The bionomics of the Aleurodid are briefly reviewed. Observations showed that adults of the overwintering generation emerged in April and that there were three overlapping generations a year and a partial fourth, the peaks of adult emergence occurring in mid-May, late July, mid-September, and late October. The duration of the egg stage depended on temperature and was 32 days in the first generation. Some of the larvae of the second and succeeding generations went into diapause, and larvae were present from April onwards. They fed on the lower surfaces of the leaves, and counts on mandarin orange showed an average of 22 per sq. cm. Sooty mould developed on the honeydew and severely affected the functioning of the leaves.

In experiments on control, sprays of 1·5 per cent. of a white oil containing 83 per cent. actual oil, 1 per cent. of a white oil containing 73 per cent. oil and 10 per cent. DDT, and 1 per cent. of a white oil containing 80 per cent. oil and 1·8 per cent. parathion had no effect on the eggs, but the DDT product killed 90–95 per cent. of the newly-hatched larvae and maintained its effectiveness for about 20 days. When applied against the second-generation larvae, the three sprays gave 99, 98 and 95 per cent. mortality, respectively, in one test, as compared with 2 per cent. for no treatment, and 95, 90 and 81 per cent. in another, as compared with 5 per cent. These results were confirmed on caged trees, and reinfestation by adults from larvae that were not killed by the treatments was negligible. Though the white oil alone appeared to be the most effective, further experiments in which the concentration of actual oil in the sprays was adjusted to 1·5 or 1 per cent. showed that the DDT mixture gave 99 and 94 per cent. mortality, the parathion 98 and 92 per cent. and the white oil alone, 98 and 90 per cent., respectively. In tests against the adults, these temporarily disappeared from trees treated with the DDT spray, and oviposition was reduced for 15 days after application, after which reinfestation occurred. Treatments against the larvae, which alone proved satisfactory, should be applied either at the end of June and the beginning of July or about 20th October, when only larvae are present. The DDT spray proved effective when applied 15 days before the end of hatching of the first generation, but it should be used with care in view of the many natural enemies of *Citrus* pests present.

Baldoni (R.). **Prove di lotta diretta contro la piralide e la sesamia del mais.** [Experiments on the Control of *Pyrausta nubilalis* and *Sesamia cretica* on Maize.]—*Ann. Sper. agr.* (N.S.) **7** no. 6 pp. 1829–1851, 6 pls., 63 refs. Rome, 1953. (With a Summary in English.)

Maize in Italy is infested by *Pyrausta nubilalis* (Hb.) and *Sesamia cretica* (Led.) [*cf. R.A.E.*, A **41** 394], the former predominating in the north and the latter in the south. The amount of damage has usually been limited owing to natural control of *P. nubilalis* [*cf. loc. cit.*], but the introduction of susceptible hybrids from the United States, the sowing of second-crop maize, which is attacked by larvae of the second generation, and the extension of cultivation under irrigation have recently caused an increase.

The methods of control adopted against *P. nubilalis* in the United States are reviewed, and the results are given of tests with sprays in northern Italy in 1951–52. Three of them were on irrigated hybrid maize near Ancona. On second-crop maize in 1951, sprays of 0·2 per cent. BHC or 0·1 per cent. DDT in wettable powders and 0·08 per cent. of a product containing 28 per cent. parathion were applied on 4th August, when the maize had tasselled and ovipositing females, eggs and larvae, mostly of *P. nubilalis*, were observed, and again on 14th August, when many larvae were present on the untreated plants, and they reduced the average number of larvae per plant from 10–12 to 2–3, though all plants were infested. The crop was harvested on 3rd October, when the percentages of ears that had failed to develop or had been completely destroyed as a result of the infestation were reduced from 23·9 for no treatment to 13·6, 7·8 and 2·3, respectively, by BHC, DDT and parathion, and infestation of the ears that developed was reduced from 65·8 to 52·4, 42·9 and 25·5 per cent. The actual yields in grain were increased from 1,800 to about 2,520, 2,934 and 3,492 lb. per acre, and the average weights of grain per infested ear were

about 2 oz. for no treatment and about 2·5, 2·6 and 3 oz. for BHC, DDT and parathion, respectively.

In 1952, medium-early and extra-late first-crop maize was sprayed with 0·17 per cent. wettable DDT or 0·1 per cent. of the parathion product on 21st June or on 10th and 21st June, 21st July and 1st August. Infestation was heavy, especially that by the second generation, but the small increases in yield obtained were not significant, and there were no differences between treatments. Second-crop maize was sprayed with 0·2 per cent. DDT or BHC in wettable powders or 0·1 per cent. of the parathion product on 26th July or on 21st July and 2nd and 13th August. The larvae normally appear at the end of July or beginning of August, but they were present from 17th July in 1952, before the maize had tasselled, and though infestation was noticeably less after treatment, larvae were still found on all plants. The percentage increases in yield for one and (in brackets) three applications were 51·4 (53·8) for DDT, 23·5 (58·6) for parathion and 17·1 (11·6) for BHC, confirming the results of the previous year.

The other test was carried out in 1952 on non-irrigated hybrid first-crop maize near Bologna. Sprays containing 0·17 per cent. wettable DDT or 0·1 per cent. of the parathion product were applied once on 21st June or four times on 11th and 21st June, 22nd July and 1st August, two applications being made against each generation. Infestation was light at first, but later reached 5–7 larvae per plant, though the second generation appeared too late to cause serious damage to the ears, which developed early. There was little difference in yield between one and four applications, but the total increases of 8·1 and 14·2 per cent. after treatment with DDT and parathion, respectively, were significant.

It is concluded that treatment is desirable to protect late hybrid maize against attack by the second generation of *P. nubilalis*, but that early varieties should not be sprayed, as this would probably harm the natural enemies that limit the damage caused by the first generation.

Delucchi (V.). *Pullus impexus* (**Muls.**) (**Coleoptera, Coccinellidae**), **a Predator of** *Adelges piceae* (**Ratz.**) (**Hemiptera, Adelgidae**), **with Notes on its Parasites.**—*Bull. ent. Res.* **45** pt. 2 pp. 243–278, 18 pls. (4 col.), 10 figs., 57 refs. London, 1954.

Lists are given of the ten insect predators found to be of value against *Chermes* (*Adelges*) *piceae* Ratz. on *Abies alba* in central Europe, of eight others that occasionally attack it, and of the four that were introduced against the Aphid on *A. balsamea* in eastern Canada [*cf. R.A.E.*, A **42** 199]. One of these was *Scymnus* (*Pullus*) *impexus* Muls. The egg, larvae and adults of this Coccinellid, its distribution, and the techniques used in studying it, in rearing the adults and in despatching consignments to Canada in 1951–52 are described, and a detailed account is given of observations in 1950–52 on its bionomics and natural enemies, carried out mainly in southern Germany (Bavaria) and eastern Switzerland.

In the areas studied, *S. impexus* was always associated with *C. piceae*, though it also developed normally on *C.* (*A.*) *nordmannianae* Eckstein in the laboratory. There was only one generation a year, and the adults, which emerged in May–June, survived for 12–13 months. They were greatly influenced by temperature and became torpid below 10–15°C. [50–59°F.]. Oviposition occurred in August–October, coinciding with the autumn generation of *C. piceae*, and was resumed to some extent by the overwintered females in April–May. In autumn, the females laid about 80–100 eggs each. They were usually deposited singly, most frequently in crevices in knots, but also elsewhere in the bark, in moss on the trunk, in exuviae or

empty puparia, and in residues of the wax secreted by *C. piceae*. They did not hatch until the spring, and eggs laid in spring and kept in the laboratory had not hatched by October, although embryonic development began in August, so that they may also overwinter. The eggs survived exposure to −25°C. [−13°F.] for one week and to −12°C. [10·4°F.] for three weeks. Hatching occurred in April, and the larvae became full-fed in about three weeks, during the period when the spring generation of the Aphid is most active. The prepupal stage lasted 8–9 days, and the pupal stage, which was passed in the moss covering the base of the trunk, occupied about ten days at 20°C. [68°F.]. Both adults and larvae fed on the eggs of *C. piceae* and on the sistentes in all stages, and the numbers destroyed by individuals in special observations are recorded. The older larvae were the most voracious and exerted the greatest control, while the adults had a slighter but more persistent effect.

S. impexus was parasitised in both Germany and Switzerland by a Pteromalid and a Braconid here described by C. Ferrière from the adult females as *Scymnophagus mesnili*, sp. n., and *Centistes scymni*, sp. n., respectively. *S. mesnili* attacks the pupae of the host, and the percentage parasitism by it varied from 0·8 to 12·6. Oviposition appears to occur at the beginning of June, and whereas some of the following generation became adult towards the end of that month or in early July, others entered diapause in the larval stage and did not complete their development until the following spring. Parasitised host pupae are distinguished by their light colour, and each usually contained two parasites. Females of *C. scymni*, oviposited in June in recently emerged adults of *Scymnus*; 3–5 eggs were deposited per host in the laboratory, but only one parasite larva developed. Winter was passed in the first instar, and the full-fed larva left its host, which then died, about the middle of May. The pupal stage, which was passed in a silken cocoon, lasted two weeks. The development of the ovaries is inhibited in parasitised females, which do not oviposit in autumn; the effect on the males, which are attacked more often than the females, is of no importance for control. The percentage parasitism by *C. scymni* varied from 23·5 to 38·5 in autumn and was 67 in one locality in spring; the apparent increase in spring is probably caused by higher winter mortality among unparasitised adults. Other natural enemies of *S. impexus* were a cephaline gregarine, which occurred in the mid-gut of the adults and of which the stages observed are described, a nematode, which was found in the body cavity of one female, and *Chrysopa ventralis* Curt., *Syrphus arcuatus* (Fall.) and *Cnemodon latitarsis* Egg., the larvae of which preyed on the larvae and pupae.

As it was undesirable to send field-collected pupae or adults to Canada, owing to the risk of introducing the Hymenopterous parasites, large numbers of the Coccinellid were reared in cages on the trees [*cf. loc. cit.*], and the adults obtained were despatched by air mail in special boxes; the mortality during transit was 6 per cent. among 4,050 adults in 1951, and 0·6 per cent. among 11,600 in 1952. The gregarine may not have been excluded in the first year.

Le Pelley (R.) & Kockum (S.). **Experiments in the Use of Insecticides for the Protection of Grain in Storage.**—*Bull. ent. Res.* **45** pt. 2 pp. 295–311, 3 graphs, 15 refs. London, 1954.

An account is given of five experiments in Kenya on the value of insecticidal and inert dusts in protecting stored maize against *Calandra oryzae* (L.). All were carried out with maize in 200-lb. bags in normal storage premises and under conditions that approximated as far as practicable

to those of normal storage. In general, the dusts were mixed with the maize prior to bagging, either with a shovel or as the grain passed through a hopper into the bags; in one experiment it was injected into the filled bags, but this method was not satisfactory, as it did not give even distribution through the grain.

Of the inert dusts tested, a local bentonitic clay at 8 oz. per bag gave no protection, and infestation in maize treated with it was significantly higher after two months than in the controls. A finely ground local soapstone at 4·8 oz. per bag did not give adequate protection, but was of some value in preventing an increase in *Calandra* during the first seven months of storage, when populations increased rapidly in the untreated controls. Its action was apparently due to its slippery nature, which prevented the easy movement of the insects through the grain. A local diatomite at 8 oz. per bag greatly reduced the percentage of maize damaged over 18 months, and this is also tentatively attributed to the slipperiness of the dust, though it may kill the weevils as well.

Of the insecticides, BHC was the most effective, and when diluted in diatomite and used at a rate of 1 part γ BHC per million parts maize, it gave complete protection for 16 months. At 0·5 p.p.m. γ BHC, it proved inadequate. Talc or the local soapstone impregnated with 0·8 per cent. piperonyl butoxide and 0·05 per cent. pyrethrins and used at a rate of 6 oz. dust per bag gave good protection for six months, but contained too little insecticide for effective control over a long period. Pyrethrum powder (1·3 per cent. pyrethrins) used at 6 oz. per bag, which corresponds to the approved limit for pyrethrins of 25 p.p.m. in grain, gave good protection for about ten months. At 36 p.p.m. pyrethrins, pyrethrum powder was highly effective under conditions of high relative humidity (65–70 per cent.), and at 17·5 p.p.m., it was significantly superior to the inert dusts. Technical DDT (84 per cent. p,p′ DDT), diluted in bentonite or diatomite and used at a rate of 7 p.p.m. in the grain was of no value. Combinations of 0·5 p.p.m. γ BHC with 7 p.p.m. DDT or 17·5 p.p.m. pyrethrins as pyrethrum powder or both or of DDT with pyrethrum powder, were significantly superior to the inert dusts and to DDT alone, but not to γ BHC or pyrethrum alone.

The maize used in one experiment included some that had passed through a conditioning plant, in which it had been cleaned, heated and dried, and in consequence contained few living insects. During the eight months of the test, infestation in this grain was considerably lower than in untreated maize, and the conditioning process itself therefore affords some protection. Parasitism by *Anisopteromalus calandrae* (How.) occurred in two of the experiments, and in one in which more detailed observations were made, it was found to reduce populations of *C. oryzae* to a low level, about which they subsequently fluctuated. This parasite first appeared in untreated maize after six months and in maize treated with pyrethrum powder after 13 months, and the possibility that pyrethrum might favour *Calandra* after losing its toxicity to it by still checking parasitism must not be overlooked.

Kerr (R. W.). **Rearing** *Drosophila melanogaster* **Mg. for Insecticide Investigations.**—*Bull. ent. Res.* **45** pt. 2 pp. 313–316, 1 pl., 8 refs. London, 1954. **A Method for the topical Application of small measured Doses of Insecticide Solutions to individual Insects.**—*T.c.* pp. 317–321, 2 pls., 9 refs. **Variation with Age in the Susceptibility to DDT and the Respiration Rate of Male and Female** *Drosophila melanogaster* **Mg.** —*T.c.* pp. 323–328, 1 graph, 13 refs.

In the first of these papers, the author describes a method of rearing *Drosophila melanogaster* Mg. that provides a high and consistent yield of

adults of uniform age and size for tests of insecticides, and so eliminates variations in susceptibility due to differences in the age of the test insects [*cf. R.A.E.*, A **31** 363; **33** 188] and their parents or in the amount of food available during development. Newly emerged adults were confined in batches of about 300 in half-pint milk bottles with sleeves of muslin or nylon closed by means of rubber bands, and the bottles were stored horizontally in a rack. Each bottle contained a waxed cork with a hole in the top to form a well for the food and a tube filled with water and plugged with wet cotton-wool on which was placed a disk of black filter paper, $\frac{3}{4}$ in. in diameter. The food was a 1 : 1 mixture of honey and compressed bakers' yeast. Newly emerged adults survived in these jars for at least 14 days when the food was changed daily, but died within 48 hours when the water tubes were not provided, and the relative humidity of the room was 40–50 per cent. Oviposition began after four days, the eggs being laid on the filter paper and round the food well. The papers bearing the eggs were transferred to fresh bottles, in which they were placed with the eggs downwards on a food medium of bakers' yeast cultured on a mixture prepared by boiling together rolled oats and aqueous solutions of agar and treacle, with a preservative. Not more than 400 eggs were placed in each jar, and rearing took place at 24°C. [75·2°F.]. The eggs hatched during the first day, pupation took place after 4–5 days in loosely crumpled cellulose wadding introduced for the purpose, and emergence of the adults, which were removed daily, began on the ninth day and reached a peak 3–4 days later. Flies that had been treated with an insecticide were kept in glass vials (3 × 1 in.) containing cotton-wool moistened with 3 ml. of an aqueous solution of treacle, yeast or both, each at a concentration of 5 per cent. Of the control flies, 100 per cent. survived for over 72 hours when the food was treacle only, and for less than 48 hours when it was yeast or the mixture. This difference is attributed to the toxic effect of the carbon dioxide generated by the growing yeast, since a higher proportion of the flies survived for 48 hours when the jars were stored on their sides so that the carbon dioxide could escape through the cotton-wool plugs. It is stated in a foot-note in the third paper that the strain of flies used (designated Rothamsted wild type) has shown a sensitivity to carbon dioxide previously recorded in only one other *Drosophila* strain.

In the second paper, the author describes a method that was used to apply doses of solutions of insecticide of the order of 0·01 mml. to adults of *D. melanogaster*. The following is virtually his summary. A microburette made from glass capillary tubing is mounted on the mechanical stage of a microscope and filled with insecticide solution to a point at which the meniscus is in the field of the microscope. The magnified images of the meniscus and a calibrated micrometer scale in the eye-piece are projected on to a small screen mounted close to the tip of the microburette so that the scale and the insect being dosed can be seen simultaneously. This feature renders the apparatus particularly suitable for topical application work in which accurate positioning of the dose on the insect is required. When an insect, held in a suction device described, is applied to the tip of the burette, the solution flows out unaided, and stops immediately the insect is removed. With the microburette described, doses from 0·005 to 0·035 mml. can be dispensed to within ± 0·00035 mml. The apparatus can be made to cover several lower or higher dosage ranges by simple modifications.

The following is based on the author's summary of the third paper, which is an account of experiments in which the methods of rearing the flies and treating them with DDT were those described in the first two. The log-probit dosage-mortality curves for males and females treated with DDT

when five days old were parallel, and males were 1·86 times as susceptible as females. Susceptibility was high in young flies, but decreased rapidly with age to a minimum at about five days, thereafter increasing rapidly in males and not significantly in females. The need for using flies of known sex and standard age in toxicity investigations was thus demonstrated. The rate of respiration in untreated males increased with age up to five days, and then decreased; in females, it increased with age up to nine days. Variations with age in respiration rate and susceptibility to DDT were thus negatively correlated.

Asahina (E.), Aoki (K.) & Shinozaki (J.). **The freezing Process of Frost-hardy Caterpillars.**—*Bull. ent. Res.* **45** pt. 2 pp. 329–339, 2 pls., 1 graph, 19 refs. London, 1954.

The following is based almost entirely on the authors' summary of this account of investigations in Japan on the mechanism of frost-resistance in insects, in which *Monema* (*Cnidocampa*) *flavescens* Wlk. was the main species used. Prepupae of this Limacodid overwinter in cocoons on the twigs or trunks of maple [*Acer*] and, since they are rarely covered by snow, are exposed to severe cold. The freezing-point of the blood was about −2°C. [28·4°F.], but the prepupae were very readily supercooled. At −20°C. [−4°F.], their bodies suddenly froze hard, and they usually withstood such solidification, even for 100 days, without harmful effects on their further development or on their progeny. From consideration of the shape of the freezing curves of the prepupae and observations on the freezing process of the blood and other tissues in isolation, it is inferred that freezing of the insect probably takes place as follows. At first, the blood freezes rapidly, and the degree of supercooling of the cells of the other tissues is very much lessened and their cooling rate temporarily decreased by the latent heat of fusion of the ice. Extracellular freezing of these tissues then takes place, but intracellular freezing is prevented, probably largely by properties of the blood and of the plasmic surface layer of the cells concerned. As the freezing of the blood continues, the cells of the other tissues undergo dehydration and contraction, but only the water drawn from within them freezes, and they usually withstand this condition for a long period, provided that the temperatures are not too low. The so-called "anabiotic" state of frozen insects [*cf. R.A.E.*, A **23** 673] is therefore not necessarily accompanied by destruction of the cell structure.

Preliminary results are also given of tests with larvae of four other Lepidoptera. Overwintered and fully grown larvae withstood freezing, even in summer, provided that it was of short duration, and when thawed their organs appeared normal. When active summer larvae of *Agrotis segetum* (Schiff.) were frozen at temperatures below −10°C. [14°F.], however, their tissues usually froze intracellularly and all were dead in an hour.

Williams (G. C.). **Observations on the Life History of** *Laemophloeus minutus* **(Ol.) (Col. Cucujidae) when bred on various stored Cereals and Cereal Products.**—*Bull. ent. Res.* **45** pt. 2 pp. 341–350, 18 refs. London, 1954.

The following is based largely on the author's summary. *Laemophloeus minutus* (Ol.) was reared in small tubes on six food materials, of a type with which the genus is commonly associated, at constant conditions of 28°C. [82·4°F.] and 75 per cent. relative humidity. Development of both sexes from egg to adult in days and (in brackets) the mortality percentages

averaged 34·27 (20·7) for Manitoba wheat, 36·07 (16·7) for wholemeal flour, 38·83 (30·7) for crushed Plate maize, 37·13 (60) for English wheat, 34·3 (78·7) for National flour (85 per cent. extraction) and 43·4 (84·7) for Canadian flour (70–75 per cent. extraction). The development period was significantly longer on Canadian flour than on any other food, and as regards mortality, English wheat differed significantly from the other materials and wholemeal flour from Plate maize. The most favourable foods were thus Manitoba wheat and wholemeal flour. The stage of development at which mortality was greatest varied with the diet. The high death-rate on English wheat was caused by the inability of newly hatched larvae to enter grains undamaged in the germ region. Mortality on National and Canadian flour occurred chiefly in the fourth instar. There were indications of cannibalism in both larval and adult stages, at least when the diet was unfavourable. The germ was attacked in preference to any other part of the wheat grain. Maize germ was also consumed, but whether it was preferred to the same extent as that of wheat was not established. Pupation in wheat occurred mainly, but not exclusively, in the grains. Normal cocoons were formed in National and Canadian flours, but some larvae pupated in loose webbing or in flour free from webbing, and freshly emerged adults were observed in unwebbed National and Canadian flour.

Williams (G. C.). **Observations on the Effect of Exposure to a low Temperature on** *Laemophloeus minutus* **(Ol.) (Col. Cucujidae).**—*Bull. ent. Res.* **45** pt. 2 pp. 351–359, 15 refs. London, 1954.

In view of the paucity of information on the ability of species of *Laemophloeus* to survive the winter in unheated warehouses in Britain [*R.A.E.*, A **25** 205; **31** 418], the effect of exposure to low temperature on the various stages of *L. minutus* (Ol.) was investigated. Eggs were laid, larvae and pupae reared and adults conditioned before exposure at 25°C. [77°F.] and 75 per cent. relative humidity. The insects were exposed to about 2°C. [35·6°F.] at various relative humidities for different periods and subsequently returned to 25°C. and the appropriate humidity. Mortality was assessed after 12 hours for larvae and adults and after hatching or emergence had finished for eggs and pupae, and a median lethal exposure time (LE 50) was obtained, when possible, by plotting log exposure time against probit mortality (corrected for mortality in the controls). The eggs proved the most susceptible, the LE 50's being 27·7, 23·4 and 24·3 hours at relative humidities of 35, 75 and 88 per cent., respectively. Larvae were exposed for 60 hours only, at 75 per cent. relative humidity, and the corrected mortality percentages averaged 24·1, 53·3, 68·2 and 2·3 for the first, second, third and fourth instars, respectively. Pupae were exposed only at 75 per cent. relative humidity, and a high proportion survived exposure for 96 hours. Adults were exposed at 35, 75 and 88 per cent. relative humidity, and the respective LE 50's in hours were 57·3, 60 and 55·6 for males, 69·7, 71·4 and 67·8 for females, and 63·3, 68·1 and 65·9 for both sexes together. Males were thus about 1·22 times as susceptible as females. Previous starvation of the adults did not affect the results obtained. When all stages were exposed together for 60 hours at 70 per cent. relative humidity, the average corrected mortality percentages were 62·5 for eggs, 38·4, 15·6, 19·8 and 7 for first-, second-, third- and fourth-instar larvae, 2 for pupae, and 26 for adults.

K. Mellanby found that insects were killed more readily by cold if they had previously been exposed to warm conditions. Since temperatures in unheated storehouses fall gradually during the autumn, *L. minutus* may become acclimatised to colder conditions and therefore support sudden

exposure to temperatures of the order of 2°C. more readily than appears from these tests. It is concluded that the Cucujid can probably survive normal winters, but may be killed by unusually cold ones.

Dobson (R. M.). **The Species of *Carpophilus* Stephens (Col. Nitidulidae) associated with Stored Products.**—*Bull. ent. Res.* **45** pt. 2 pp. 389–402, 41 figs., 3 refs. London, 1954.

This paper supplements Hinton's treatment in a work already noticed [*R.A.E.*, A **33** 330] of the species of *Carpophilus* associated with stored products and includes a key to 16 species of the genus, figures of certain taxonomic characters used, redescriptions of *C. nitidus* Murr., *C. succisus* Erichson, *C. mutilatus* Erichson and *C. fumatus* Boh., which is not recorded from stored products but closely resembles *C. mutilatus*, and notes on the occurrence of various species in Britain or other parts of the world. The species associated with stored products in Britain [*cf.* **32** 187] are *C. hemipterus* (L.), *C. dimidiatus* (F.), *C. ligneus* Murr. and *C. obsoletus* Erichson, which are frequently introduced and have become established, *C. mutilatus* and *C. maculatus* Murr., which are introduced less frequently, but are sometimes numerous, and *C. flavipes* Murr., *C. marginellus* Motsch., *C. humeralis* (F.), *C. nitidus* and *C. succissus*, which are occasionally imported in small numbers; in addition, there is an early record of *C. sexpustulatus* (F.), a rare native species, infesting dried fruit. A table is appended showing the number of times that each of ten species has been recorded from various commodities in England and Wales during 1948–50 and Scotland during 1943–50, with the place of origin of the commodity and its port of shipment.

Wright (D. W.). **Contributions to the Bionomics and Control of the Cabbage Root Fly (*Erioischia brassicae* Bché.).**—*2nd Rep. nat. Veg. Res. Sta. 1950–51* pp. 10–20, 4 refs. Wellesbourne, 1952.

Following the development of the dust treatment with 4 per cent. calomel (mercurous chloride) against *Hylemyia* (*Erioischia*) *brassicae* (Bch.) on crucifers in Britain in 1938–39 [*R.A.E.*, A **29** 383], experiments were continued with it in subsequent years. The previous work showed a relation between loss of yield and the proportions of plants killed or stunted when infestation was high [**29** 384], and in tests on early cauliflower at Cambridge, treatment in 1939, 1940 and 1945, when less than 15 per cent. of the control plants were killed by the fly, also gave considerable yield increases and more than doubled the percentage of first-grade heads. The complete observations from 1939 to 1951 showed considerable variations in the severity of damage from year to year on untreated plots, and these seemed to be due to biological factors, such as natural enemies, rather than to rainfall in May and June, the main period of growth, but as damp soil favours recovery from attack, the yield increases due to treatment were negatively correlated with rainfall in those months.

As the control given by calomel, though high, was usually not complete and a 5 per cent. DDT dust, applied to the base of the plants in the same way, proved ineffective, some of the newer synthetic insecticides were tested in 1951; the rates of application given are per 4,840 plants unless otherwise stated. In Warwickshire, dusts of 4 per cent. calomel and 0·17 and 0·45 per cent. γ BHC applied with a spoon round the stems of the transplanted crop at 45, 46 and 17 lb., respectively, and the 0·45 per cent. γ BHC dust applied round the stems with a hand duster at 34 lb. reduced the percentage

of root systems severely infested from 79 to 33, 3, 1 and 4, respectively, on summer cabbage, and 0·45 per cent. γ BHC applied at 18·3 lb. with a hand duster and a dust of 5 per cent. chlordane at 30 lb. with a spoon reduced it from 75·5 to 12 and 1·5, respectively, on autumn cauliflowers. At Cambridge, 0·45 per cent. γ BHC and 5 per cent. chlordane applied to spring cabbage at 17 and 30 lb., respectively, with a spoon, reduced the percentage of severely infested roots from 100 to 6·2 and 0, 4 per cent. calomel at 45 lb., 0·45 per cent. γ BHC at 17 lb., 5 per cent. chlordane at 30 lb. and a dust of 5 per cent. toxaphene at 30 lb., applied to autumn cauliflower with a spoon, reduced the percentage from 32·5 to 0, 0, 0 and 11·3, respectively, and 4 per cent. calomel applied to early cauliflower at 45 lb. with a spoon reduced it from 90 to 1·7, whereas 0·45 per cent. γ BHC dust broadcast at 222 and 444 lb. per acre and raked in one day before early cauliflower was transplanted and the second rate broadcast and raked in 12 days before transplanting permitted 38·3, 23·3 and 41·7 per cent. severely infested root systems, respectively. Application with a spoon appeared to be a much more satisfactory method of treating the base of the plant than application with a hand duster, and broadcasting was inferior to both. In tests of liquids applied by hand to the base of the plants, suspensions of 0·005 and 0·01 per cent. γ BHC at 0·25 and 0·125 pint per plant, respectively, reduced the percentage of severely infested root systems from 79 to 12·5 and 6 on summer cabbage, and 0·005 per cent. γ BHC, a suspension of 0·1 per cent. chlordane and an emulsion containing 0·025 per cent. parathion, all at 0·25 pint per plant, reduced it from 75·5 to 4, 6 and 2·5, respectively, on autumn cauliflower.

Field observations showed that BHC, chlordane and parathion do not act by deterring adults from ovipositing round treated plants. In laboratory tests with them, 50, 90 and more than 93 per cent. of the larvae failed to hatch from eggs treated with 0·005 and 0·01 per cent. γ BHC suspensions and 0·025 per cent. parathion emulsion, respectively, and those that did hatch died very soon, whereas all eggs treated with 4 per cent. DDT dust hatched, and subsequent mortality was very variable, many larvae wandering over the moist insecticide dust for 24 hours before succumbing; the 0·45 per cent. γ BHC dust was similar in its effect to the 0·01 per cent. suspension.

Dunn (J. A.). **The Effect of Temperature on the Pea Aphid—Ladybird Relationship.**—*2nd Rep. nat. Veg. Res. Sta. 1950–51* pp. 21–23, 1 graph, 4 refs. Wellesbourne, 1952.

Since the temperature ranges over which insects and their natural enemies are active do not always coincide, laboratory experiments were carried out in 1951 to compare the reproductive rate of viviparous females of *Macrosiphum* (*Acyrthosiphon*) *pisum* (Harris) and the rate at which the Aphid is consumed by adults of *Coccinella septempunctata* L., its most important predator on leguminous forage crops in eastern England, at temperatures of 41, 50, 58 and 68–70°F. The average numbers of Aphids produced and consumed per individual per day were plotted against temperature, and the resulting graph showed that at 41°, the Aphid reproduced slowly and the Coccinellids were inactive and did not feed, that between 41 and 51°, each Aphid produced a greater number of progeny than could be consumed by a single Coccinellid, and that above 52°, the consumption potential of the Coccinellid exceeded, in increasing measure, the reproduction potential of the Aphid. The differing effects of temperature on these two insects are reflected in the seasonal abundance of the Aphid on forage crops; in March–April and September–October, when the average temperature is often

below 50°F., Aphid populations increase markedly, whereas during the summer they are reduced by the Coccinellid except during sudden cold periods.

Wheatley (G. A.). **Notes on insecticidal Dust Deposits with special Reference to the Pea Aphid** (*Acyrthosiphon pisum* **Harris**).—*2nd Rep. nat. Veg. Res. Sta. 1950–51* pp. 24–30, 2 graphs, 6 refs. Wellesbourne, 1952.

Insects receive a toxic dose of a contact insecticide applied as a dust either from a deposit on the body or by moving over the dusted surface, and both ways are usually involved, their relative importance depending largely on the habits of the insect. Aphids are frequently found within the growing points and flower heads of plants and hence escape direct treatment, but as *Macrosiphum* (*Acyrthosiphon*) *pisum* (Harris) is a relatively active species, especially at temperatures above 65°F., the importance of the two methods in its control was investigated. A dust of 0·5 per cent. DDT (in talc) and pea plants from which the lower leaves and growing points were removed were used. When the dust was applied at 0·5 gm. to both Aphids and plant, which remained in association, to Aphids that were removed to undusted plants immediately after treatment, and to the plant before Aphids were transferred to it, the mortality percentages were 72·9, 13·26 and 59·91, respectively, in 24 hours, and when the dose was increased to 1 gm., they were 84·22, 26·12 and 59·37. These results indicate that control is largely due to movement over the dusted surface, and field treatment will therefore be most effective when the prevailing temperature is above 65°F.

Further tests showed that the degree to which the dust was deposited on a pea plant from a dust cloud was independent of variations in the size of the individual leaves or stipules, the form of the whole plant probably masking the effects of its individual parts.

Caresche (L.) & Metaye (R.). **Études concernant la lutte contre deux rhynchotes nuisibles au théier dans le Haut-Donnai.**—*Arch. Rech. agron. Cambodge* 1951 no. 9, 31 pp., 6 pls., 4 tables, 3 refs. Saigon, 1951.

The two principal pests of tea in southern Viet Nam are the Mirid, *Helopeltis theivora* Waterh., and the Jassid, *Empoasca flavescens* (F.), the adults and eggs of both of which are briefly described. Observations showed that *H. theivora* bred only on tea and *Cinchona* and was commonest in damp, sheltered environments. The adults flew readily, and both they and the nymphs punctured the young leaves of the tea and the tips of the shoots, causing considerable damage. Injury was most widespread in neglected, unthrifty or sheltered plantations. In the laboratory, the females paired 5–9 days after reaching maturity and oviposited 8–10 days later, the eggs being laid singly or in groups of 2–3 in the main veins of the young leaves and particularly in the green terminal sections of the twigs; though only 15 per cent. of them would be removed in plucking. Repeated pairing was necessary for the fertilisation of all the eggs. The egg and nymphal stages lasted 8–10 and 25–28 days, respectively, and there were several generations a year, infestation being heaviest in the rainy season, from July until the end of November. The variety of tea principally grown (Shan) appeared to be the most preferred of several tested.

E. flavescens preferred the young parts of the plants, but adults were also found on old leaves. The Jassids were most numerous on plants

sheltered from the wind and on the lower surfaces of the leaves, remaining on the foliage even in bright sunshine, and their feeding caused discoloration and rolling of the leaves and sometimes stunting. The eggs were deposited in groups in the tips of the twigs or in the main veins of young leaves. Injury was greatest during the dry season, from the end of December to April, nursery plants and those in a weakened condition being heavily infested.

In experiments on chemical control, dusts of 10 per cent. DDT or 8 per cent. BHC at about 36 lb. per acre and wettable-powder sprays of 0·25 per cent. DDT or 0·24 per cent. BHC, with a wetter, at about 54 gals. per acre, were applied to plots four times at about monthly intervals (after plucking) between August and December 1949 and then three times, as required by the level of infestation, between January and August 1950, the plots that received one insecticide in the first period receiving the other in the second. The results were not conclusive as infestation was light and the remainder of the plantation, except for the control plots, was dusted with BHC or DDT by the grower, with resulting drift on to the experimental sections, but all treatments freed the bushes from both insects for a few days or weeks, depending on the persistence of the deposits under the weather conditions prevailing, and populations were very low towards the end of the experiment; average yields were almost unaffected, though there were slight increases, especially for the dusts, in the early pluckings.

In laboratory tests with dusts, DDT was slightly more rapid in action than BHC against *E. flavescens*, but the two were about equal against *H. theivora*. Parathion was rather slower than DDT against the latter.

Puttarudraiah (M.) & Raju (R. N.). **Observations on the Host Range, and Control of** *Azazia rubricans* **Boisd.**—*Indian J. Ent.* **14** pt. 2 p. 158, 2 refs. New Delhi, 1952.

Anticarsia irrorata (F.) (*Azazia rubricans* (Boisd.)), which was hitherto known as a pest of pulse crops in India [*cf. R.A.E.*, A **31** 357], is here recorded attacking cereals for the first time. Severe infestations occurred on *Eleusine coracana* round certain villages in Mysore, and in each case were confined to a few fields. The larvae defoliated the plants, which remained bare except for the ears, and when fully grown pupated within silken cocoons in folded leaves or immediately below the soil surface. *Sorghum vulgare*, *Setaria italica* and some grasses were also attacked, as well as cowpea and *Dolichos lablab*. Both larvae and pupae can readily be dislodged from the plants and can then be collected and destroyed. Fowls were observed feeding on the larvae, and both larvae and adults of *Calosoma maderae indicum* Hope destroyed examples on the soil and provided an effective check.

Gurdas Singh & Bhatia (K. R.). **Population Density of Hopper Bands of the Desert Locust** (*Schistocerca gregaria* **Forsk.) in different Instars.**—*Indian J. Ent.* **14** pt. 2 pp. 161–164, 3 figs., 3 refs. New Delhi, 1952.

Observations on the relative density of bands of hoppers of *Schistocerca gregaria* (Forsk.) in different instars were made in India during 1951 by means of a wooden frame, one foot square, lined on the inside with smooth, galvanised iron sheeting up which the hoppers cannot climb. The frame is held by long wires on either side, and dropped over the hoppers, which are then killed by dusting with 50 per cent. BHC and removed for counting. The results are shown in a table, and indicated that in the bands studied hoppers in the first instar were about 30 times as numerous per sq. ft. as

those in the fifth instar, regardless of the density of the bands. The denser bands of first- and fifth-instar hoppers contained averages of 2,840 and 94 individuals per sq. ft.

Gurdas Singh & Sardul Singh. **Percentage of Mortality of the Desert Locust** (*Schistocerca gregaria* **Forsk.) in Egg Stage.**—*Indian J. Ent.* **14** pt. 2 pp. 165–168, 2 figs., 2 refs. New Delhi, 1952.

Observations on egg mortality in *Schistocerca gregaria* (Forsk.) were made in Rajasthan, India, during the monsoon breeding season of 1951. A plot, 20 × 10 ft., in an egg bed was divided into six parts, three of which were separately enclosed by galvanised iron sheeting to prevent the hoppers from escaping. The eggs were counted on the other three, and they averaged 54 per pod. Hatching began on 30th July, after an incubation period of ten days, during which the daily maximum and minimum temperatures were 87·3–109·3 and 73·6–87·9°F., respectively, the relative humidity was 49–89 per cent. and 2·25 ins. rain fell. On 1st August, the hoppers were killed by dusting with 10 per cent. BHC and counted, and the numbers of egg pods from which they had hatched, as indicated by the exit holes in the ground, were determined. It was calculated from the figures obtained that mortality of the eggs was 9–10 per cent.

Pradhan (S.) & Bhatia (S. C.). **Comparative Toxicity of some important Insecticides to** *Bagrada cruciferarum* **Kirk. (Pentatomidae: Hemiptera) I.**—*Indian J. Ent.* **14** pt. 2 pp. 169–171. New Delhi, 1952.

This is the first of a proposed series of papers giving the results of investigations in India on the relative toxicity of recently developed insecticides to various important insect pests. They are being carried out to provide information on which practical control operations can be based. In the tests described, adults of *Bagrada cruciferarum* Kirk. were sprayed in petri dishes in a spray tower with various concentrations of the insecticides, the spray deposits averaging 0·6 mg. per sq. cm., removed to clean dishes after two minutes, and observed for mortality after 48 hours. Concentration-mortality curves were constructed from the results, and the concentrations giving 50 and 90 per cent. mortality are shown for each insecticide in a table. On a basis of 50 per cent. mortality, parathion and aldrin in wettable-powder sprays, γ BHC, toxaphene, a thiocyanate preparation (Lethane 384), thanite and DDD in emulsion sprays prepared with benzene as solvent and a wetter, and pyrethrins in colloidal suspension were 59·05, 8·86, 39·86, 3·67, 0·9, 0·85, 0·75 and 7·42 times as toxic, respectively, as p,p′DDT in an emulsion spray, for which the 50 per cent. lethal concentration was 0·3189 per cent.

Syed Usman. **A new Host of** *Sitophilus oryza* **(Linn.).**—*Indian J. Ent.* **14** pt. 2 pp. 173–174, 7 refs. New Delhi, 1952.

Calandra (*Sitophilus*) *oryzae* (L.) was observed, together with the more usual *C.* (*S.*) *linearis* (Hbst.), breeding in stored tamarind seeds from various localities round Bangalore. In studies on its life-cycle, the females deposited 6–10 eggs per seed, the contents of which were completely destroyed by the larvae and newly emerged adults, and development was completed in 39–53 days at 68–89°F. Adults that developed in tamarind seeds were small and dark in colour. The sexes were almost equal in numbers, and pairing took place within a day of two of emergence.

Newton (W.) & Peiris (J. W. L.). **Virus Diseases of Plants in Ceylon.**—*FAO Plant Prot. Bull.* **2** no. 2 pp. 17–21, 1 fig., 2 refs. Rome, 1953.

It is stated in the course of this survey that a virus disease of cacao, the symptoms of which closely resemble those of an attenuated form of swollen shoot [*R.A.E.*, A **37** 232, etc.], has recently been shown to be common in Ceylon, though no die-back or other evidence of conspicuous injury that could be attributed to it was found. In experiments, the disease was transmitted to seedlings by grafting and by mealybugs tentatively determined as *Planococcus* (*Pseudococcus*) *lilacinus* (Ckll.) and *P.* (*P.*) *citri* (Risso). Evidence that mealybugs are the principal vectors is provided by the local distribution pattern of the disease, which usually radiates outwards from a central focus of heavily infected trees, gradually decreasing in severity. The disease rarely occurred in trees less than ten years old, but plantations of 20 years and over were invariably infected.

Husseini (S. Y.). **The Wheat Leaf Miner,** *Syringopais temperatella*, **in Jordan.**—*FAO Plant Prot. Bull.* **2** no. 2 pp. 22–23. Rome, 1953.

Syringopais temperatella (Led.) is a major pest of wheat and, to a less extent, of barley in Jordan and neighbouring countries, and investigations on its bionomics were begun by the author in 1937. The larvae mine the leaves, which become light brown in colour, and destroy the internal tissues. As many as 20 may be present in a single leaf, and some attack more than one leaf. Losses vary from 30 to 100 per cent. of the wheat crop in individual fields, and are heaviest on poor soil during dry winters. The total annual loss in Jordan amounts to 15–20 per cent.

Adults have been observed as early as 25th March, but usually appear in the fields in early April and become numerous during the latter half of that month. Oviposition begins 5–7 days after emergence and continues for ten days, each female laying 100–200 eggs singly or in small groups on the wheat blades. The larvae hatch in 5–7 days and immediately enter the soil, where they aestivate in cocoons, mostly at depths of 5–10 ins. [*cf. R.A.E.*, A **32** 85]. They resume activity about the beginning of January and mine in the young leaves, which they usually enter from the tip. Damage becomes conspicuous during February and March and appears rather earlier on the plains than in the hills. The full-fed larvae enter the soil and construct cocoons at a depth of about an inch. Pupation takes place about the beginning of March, and the adults emerge within two weeks.

S. temperatella is readily controlled by cultural measures. Wheat should be grown only in rotation with crops that are not attacked by the pest, and the fields should be ploughed to a depth of 12–14 ins. after the harvest. If infestation occurs, wheat should not be sown in the same field for at least two years.

Miller (P. R.). **Plant Disease Situation in the United States.**—*FAO Plant Prot. Bull.* **2** no. 2 pp. 24–27, 1 ref. Rome, 1953.

One of the diseases dealt with in this review is virus yellows, which has affected beet and related crops in the seed-producing areas of north-western Washington since 1940, but has until recently been attributed to nutritional deficiency. Only the mild form of the disease appears to be present, but, owing partly to the concentration of seed crops in the area and partly to the method of cultivation adopted, its incidence is heavier than in Michigan, Colorado, Utah, Oregon and California, where it also occurs. In Washington, seed is sown in beds during June, the plants (stecklings) are lifted in

late autumn and stored in pits until the following March–April, when they are put out in the fields, and the seed is harvested during August–September. Virus symptoms become apparent in the transplants during June or July. Owing to the practice of placing the seed beds indiscriminately among and often next to the maturing seed fields, which facilitates Aphid migration from the latter, infection among the stecklings is high, and often reaches 100 per cent. in beet, mangel and Swiss chard. *Aphis fabae* Scop. is the commonest insect in the seed fields, but is not regarded as an important vector, whereas *Myzus persicae* (Sulz.), which is believed to be of prime importance, is rarely numerous. Isolation of the seed beds, which has proved effective against beet mosaic [*R.A.E.*, A **37** 128], is of no value against virus yellows without control of the Aphid vectors in them and during the early growth of the stecklings, probably because of the persistence of the virus in the vectors and the widespread cultivation of biennial seed crops. DDT, BHC, parathion, malathion and Metacide [parathion and methyl-parathion] were unsatisfactory in tests over several years in which they were applied to root beds near infected seed crops, and Systox [diethyl 2-(ethylmercapto)ethyl thiophosphate], which gave appreciable control, is not recommended for use on steckling beds; all gave control ranging from fair to good on root beds isolated from the seed-producing area. Since adequate control of the vectors in the root beds cannot be obtained, it is necessary to raise the stecklings in areas that are free from the virus and well isolated from the seed fields, favourable positions for which are becoming increasingly difficult to find, and to control migratory Aphids.

Outbreaks and new Records.—*FAO Plant Prot. Bull.* **2** no. 2 pp. 28–29. Rome, 1953.

New records reported by C. G. MacNay from Canada include *Psylliodes chrysocephala* (L.) on rape in Newfoundland; and *Tortrix* (*Cacoecia*) *oporana* L., which attacks a wide range of fruit trees, on snowberry (*Symphoricarpus* sp.), and *Macropsis fuscula* (Zett.) on loganberry, both in British Columbia. All three were observed in 1952 and are believed to be new to North America.

Balch (R. E.). **Studies of the Balsam Woolly Aphid, *Adelges piceae* (Ratz.) (Homoptera: Phylloxeridae) and its Effects on Balsam Fir, *Abies balsamea* (L.) Mill.**—*Publ. Dep. Agric. Can.* no. 867, 76 pp., 47 figs., 47 refs. Ottawa, 1952.

The following is taken from the author's summary of this account of investigations on the bionomics of *Chermes* (*Adelges*) *piceae* (Ratz.) and the damage that it causes to balsam fir (*Abies balsamea*) in Canada, some of the findings of which have been noticed from earlier sources [*R.A.E.*, A **21** 283; **22** 313; **24** 605]. *C. piceae* was introduced into Nova Scotia about 1900, probably on nursery stock, and is now established on *A. balsamea* throughout the whole of that Province and Prince Edward Island, the southern half of New Brunswick, and much of the north-eastern United States. It has also reached two points in Newfoundland. Its distribution on the tree is determined by the negative geotaxis and positive phototaxis of the motile larvae, and by the accessibility of young parenchyma at the surface. Dispersal is effected by surface winds and vertical air currents, and the general occurrence of *A. balsamea* in the region favours successful

establishment. The rate of spread in eastern New Brunswick exceeded five miles per year in recent years.

The sistentes have a high reproductive potential. The chief climatic factor controlling rate of increase is low winter temperature. Only the neosistens can survive the winter, and this stage may be completely killed above snow when temperatures drop below −30°F. The protection of a small part of the population by snow is sufficient to prevent extermination, however, and to permit establishment throughout most of the range of the food-plant. Sun and rain limit survival on exposed parts of the tree. Direct sun during midsummer kills the insect through the high temperatures produced on the surface of the bark. The ultimate level of population in a stand is determined by biotic factors, the chief of which are the resistance of the tree and insect predators. Trees vary in their suitability as a source of food and in the amount of shelter they afford. They are also capable of resisting continued attack by laying down a secondary periderm beneath the feeding sites. Several native predators attack *C. piceae*, but their control value is limited by dependence on a dense population of their host. The introduced predator, *Leucopis obscura* Hal., has spread rapidly throughout the range of *C. piceae*, tending to replace native predators [**22** 314; **30** 466; **35** 9], but it has a similar limitation and species with greater searching ability are desirable [*cf.* **42** 199]. Ability to attack the neosistens would also be a valuable characteristic, as this stage is present throughout the year.

The long, slender stylets of the insect are inserted intercellularly in the cortex, or phelloderm, where a pocket of parenchyma is probed. Their renewal at moulting and the mechanism by which they are controlled are discussed. The condition known as "gout disease" of *A. balsamea* [**21** 283] is a morphogenic response to the salivary injection of the insect. Striking hypertrophy results in the cells immediately affected by the stylets. The enlarged cells have thickened, ridged walls and enlarged, sometimes double, nuclei. Hyperplasia occurs in the surrounding tissue, and pockets of hypertrophied cells may be encysted by a purplish secondary phellem. The cambium is stimulated and produces an abnormal, reddish-brown, brittle type of wood. The tracheids are similar to those of "compression-wood", which is caused by a gravitational stimulus. Similar results were obtained by treatment with indole-3-acetic acid in lanolin. Hormonal action is indicated. The reactions vary with the species of *Abies*. "Gout" is produced in several North American species, but not in the European ones. Abnormal wood growth has been found only in *A. balsamea*.

When a stand first becomes infested, the insect multiplies most rapidly on the larger trees, but trees of all sizes may be attacked and killed. Severe attack on the stem may result in death within three years without any symptoms of "gout". "Gout" is caused by light to moderate attacks on the new shoots over a longer period. After the first outbreak in a stand, the surviving trees begin to show the symptoms of the disease. Some may recover; others die slowly. Trees suffering from persistent attack have rapid taper and low-quality wood, for both sawlogs and pulpwood. Death results from inhibition of bud growth, killing of large areas of the outer bark, and interference with conduction caused by the abnormal wood. Severe mortality and loss of growth have resulted over considerable areas. There is no consistent relation between site, or forest type, and amount of damage. Advance growth is often killed. Where spruce predominates in young stands, a desirable thinning favouring the spruce may sometimes result.

The insect can be controlled by oil sprays [**21** 284], but insecticides will be of value in forests only after complete winter-killing above snow. Control can be combined with salvage by special cutting operations. Short

cutting cycles, management of balsam fir on a short rotation, favouring spruce in selective cutting, and maintenance of full stocking in immature stands are recommended.

Flanders (S. E.). **Biological Observations on Parasites of the Black Scale.**—*Ann. ent. Soc. Amer.* **45** (1952) no. 4 pp. 543–549, 2 figs., 14 refs. Menasha, Wis., 1953.

During the past 50 years, 34 species of Hymenoptera parasitic on *Saissetia oleae* (Bern.) were introduced into California. Biological control was largely attained through the establishment of *Metaphycus helvolus* (Comp.), but in a few localities and in certain years, this parasite is not effective, because of prolonged periods of low winter temperatures, which reduce the number of generations per generation of the host. The introduction of additional parasites is therefore being continued, and in this paper, the author gives a list of 29 primary parasites and seven hyperparasites of the Coccid, showing their native habitat so far as known, the earliest stages of *S. oleae* in which development occurs and those that are established in California. He also discusses the relations to *S. oleae* and to one another of more than 25 of them. *M. helvolus* has no parasites that reduce its effectiveness.

Burchfield (H. P.), Redder (A. M.), Storrs (E. E.) & Hilchey (J. D.). **Improved Methods for rearing Larvae of *Aedes aegypti* (L.) for Use in Insecticide Bioassay.**—*Contr. Boyce Thompson Inst.* **17** no. 5 pp. 317–331, 3 graphs, 6 refs. Yonkers, N.Y., 1953.

Since the advantages of a recently described method for the bioassay of organic insecticides, based on their ability to inhibit the phototactic response of larvae of *Aëdes aegypti* (L.) [*R.A.E.*, A **42** 76], may be nullified by variations in the vitality of the larvae, several factors that affect their resistance in the photomigration test were investigated, and an improved method of rearing [*cf.* B **34** 24] was developed. The resistance of the larvae was measured by the time required by a carbitol-water suspension of heptachlor or chlordane to inhibit the phototactic reaction in 50 per cent. of them (T50). The insecticides were dissolved in the carbitol (2-(2-ethoxyethoxy)ethanol) at concentrations so adjusted that the required amounts in the suspensions were obtained by mixing 1 ml. solution with 99 ml. water containing 100 larvae.

The main factors concerned in resistance were the age, instar and environment of the test larvae. Tests in which the larvae were exposed to 0·1 part per million heptachlor immediately or at intervals after hatching showed that resistance was very high initially, but dropped rapidly during the first 12 hours, after which it increased gradually until the first moult. It dropped suddenly after this and each subsequent moult, but increased progressively during each instar and exceeded the initial resistance after 76 hours, in the fourth instar. The best time for testing is immediately after a moult, when resistance is low and the larvae can be maintained in distilled water for a considerable time without moulting, but moulting should be complete throughout the test batch or larvae of the earlier instar removed, to avoid mixed populations of individuals with different degrees of resistance. It is therefore desirable to adjust conditions so that moulting will occur at a predetermined time. Under the rearing conditions of the test, the second instar lasted about eight hours and the third 24, but T50 was much shorter in the former, the use of which thus accelerated testing and increased sensitivity; this is important for chemicals that act slowly

and are therefore difficult to detect at concentrations below 0·1 p.p.m. The use of second-instar larvae also reduces the time required for rearing and the risk of toxic effects due to spoilage of the nutrient. The most convenient rearing time for obtaining large batches of larvae suitable for a complete day's testing proved to be 22 hours, and this was adopted for general use. Even under the best environmental conditions, the yield of second-instar larvae in 22–24 hours was variable, but maintaining the newly-hatched larvae for 18·5 hours in distilled water before the introduction of the nutrient resulted in more uniform moulting.

Apart from differences in growth rate, the chief source of error in the T50 tests was that some populations floated on the test medium and these responded irregularly to insecticides. Floating was, however, virtually eliminated by the addition of small quantities of Pluronic F-68 (a polyethylene-polypropylene glycol) to the rearing and test media.

In the method of rearing finally adopted, the caged adults were fed daily on 1 per cent. dextrose solution, offered blood-meals on guineapigs for one hour a day, and supplied with moist filter-paper for oviposition. The eggs were collected every 24 hours, washed and stored on moist filter-paper in a closed container for five days, and then air-dried for more permanent storage. Hatching was stimulated by immersion for 15–30 minutes in a solution containing 1 per cent. dextrose and 0·15 per cent. U.S.P. XIV salt mixture, and larvae intended for the tests were transferred in batches of 2,000 to 12-litre flasks containing eight litres of water in which 10 p.p.m. Pluronic F-68 had been dissolved. The flasks were stoppered with cotton and kept in a water bath at 29·5°C. [85·1°F.]. After 18·5 hours, 250 ml. water containing 0·25 per cent. of a mixture of brewers' yeast, blood albumin and sucrose (5 : 3 : 2) was added, and the larvae were incubated for a further 22 hours. If most were then in the second instar, they were filtered out of the nutrient without exposure to the air, washed in 10 p.p.m. Pluronic F-68 and kept in batches of 100 in water containing enough of the wash solution to give a concentration of 1 p.p.m. when the test was made. If many first-instar larvae were present after 22 hours incubation with food, they were incubated for a further hour or two to permit additional moulting.

Tests in which second-instar larvae were exposed to chlordane at 0·5 p.p.m. or to heptachlor at 0·01–0·2 p.p.m. at intervals after removal from the nutrient solution showed that T50 increased linearly during the first eight hours and that it was necessary to subtract 0·7 minute for each hour after removal to obtain a standard value from the observed one. Tests made at intervals in the course of the work showed that the standard deviation in T50 between batches was reduced from 4·21 to 1·58 minutes (about 62·5 per cent.) by the improvements in technique developed.

Further causes of variability may include the type and degree of bacterial contamination of the rearing medium, and variations in the average age and viability of the adults from which the eggs are obtained; there was evidence that larval viability undergoes periodic changes, and this may be related to conditions in the adult colonies.

Burchfield (H. P.) & Storrs (E. E.). **Partition of Insecticides between N,N-Dimethylformamide and Hexane.**—*Contr. Boyce Thompson Inst.* **17** no. 5 pp. 333–334, 4 refs. Yonkers, N.Y., 1953.

The presence of lipids in plant extracts inhibits the action of insecticides in bioassay tests, and it has been suggested that this effect can be minimised by extracting the insecticides from hexane solution with acetonitrile. In experiments with a number of solvents, carried out in connection with a

bioassay method using mosquito larvae [*cf. R.A.E.*, A **42** 76], a mixture of N,N-dimethylformamide (boiling point 152–154°C.) and n-hexane (b.p. 62–67°C.) gave the most favourable partition. When 10 ml. hexane containing 0·1 gm. lindane [almost pure γ BHC], DDT or aldrin was shaken with 10 ml. dimethylformamide in a separatory funnel and the dimethylformamide drawn off and analysed, the percentages of these insecticides recovered from it were 99·7, 91·3 and 79·7, respectively, as compared with 86 and 57 per cent. for lindane and DDT in the earlier tests with acetonitrile. In a similar test with maize oil (a typical glyceride), only 7·3 per cent. of it was extracted by dimethylformamide. Bioassay methods are so sensitive to traces of lipids that a more complete separation would be desirable, but the partition coefficients are favourable in both directions, and it should be possible to set up a countercurrent distribution method that would provide a highly purified sample in comparatively few steps. The high boiling point of dimethylformamide does not prevent its use, since the insecticide can be recovered from it by diluting with a large amount of water and re-extracting with hexane.

Materials such as chlorophyll, carotene and sterols may also inhibit insecticidal action; some could be removed by preliminary chromatographic adsorption, but additional procedures might have to be developed for others.

Hartzell (A.). **The Imported Long-horned Weevil.**—*Contr. Boyce Thompson Inst.* **17** no. 5 pp. 334–336, 1 fig., 4 refs. Yonkers, N.Y., 1953.

A short account is given of the bionomics and distribution of the introduced weevil, *Calomycterus setarius* Roel., in the United States [*cf. R.A.E.*, A **34** 105], with a list of the numerous plants on which it feeds. It can be killed by spraying with rotenone when the adults appear on the foliage, but no fully effective control measures are known.

Primera asamblea latinoamericana de fitoparasitología. [First Latin-American Congress of Phytoparasitology.]—*Foll. misc. Sec. Agric. Méx.* no. 4, 426 pp., illus., refs. Mexico, D.F., 1951.

The following are abstracts of entomological papers read at this congress, which was held in September–October 1950.

Cevallos G. (M.A.). **Control de gorgojos del maíz almacenado en la hacienda** [Control of Weevils in Maize stored on the Farm], pp. 21–26. Maize is an important crop in Ecuador, and at least 10 per cent. of that stored in open farm granaries is destroyed by *Calandra* (*Sitophilus*) *oryzae* (L.), *C.* (*S.*) *granaria* (L.) and *Pagiocerus frontalis* (F.). In tests under simulated farm conditions, empty granaries were treated with an atomised suspension spray of 2·5 lb. DDT or 2 lb. γ BHC per 88 gals. water, aired for 15 minutes and infested with adults of *C. oryzae* and *P. frontalis* at intervals for the next 12 days. Mortality was complete in every case in three days or less.

Delgado M. (N.) & Hernández Luna (R.). **Control del gorgojo de la semilla del maíz** (*Prostephanus truncatus* (**Horn**)) [Control of the Maize-seed Beetle, *P. truncatus*], pp. 26–29. In experiments in Mexico in 1948 on the control of *Prostephanus truncatus* (Horn) in maize stored for seed, uninfested maize was treated with various dusts, placed in lots of 500 gm. in cardboard containers and infested with 100 examples of the Bostrychid of different ages. The grain was examined every three days or left untouched for six months, and it was then reinfested and examined for a further period, and this process was continued for several years. The

materials tested were 3 per cent. DDT at 0·25–1 gm. per 500 gm. maize, 5 per cent. DDT at 0·5 gm., 7·5 per cent. BHC at 0·25–1 gm., and magnesium oxide, a mixture of 3 per cent. DDT and magnesium oxide, Arasan [50 per cent. tetramethylthiuramdisulphide], 5 per cent. chlordane, and talc, all at 0·5 gm. The results are given for total damage at the end of the first year, germination after 18 months and insect mortality after two years. Total damage was less than 2 per cent. for all materials except talc, as compared with nearly 44 per cent. in the controls, the percentage germination was 85 or more in all cases in which it was assessed, as compared with less than 67, and insect mortality was complete in 6–10 days for all materials except talc, which was ineffective, BHC and the DDT mixture being the most rapid in action. Mortality in the controls was very low.

Osorio A. (F.). **Las principales plagas del maíz encontradas en los campos experimentales de la Comisión del Maíz durante 1950** [The principal Pests of Maize found in the Experimental Fields of the Maize Commission in 1950], pp. 30–34. The chief pests found damaging maize in the field in various parts of Mexico in 1950 were *Laphygma frugiperda* (S. & A.), *Macrodactylus* spp. (*M. mexicanus* Burm. and *M. virens* Bates), *Aphis maidis* Fitch, *Paratetranychus* sp., *Atta* sp. and *Diatraea crambidoides* (Grote). Notes are given on their distribution, habits, importance and control.

Cervantes (J.) & Rodríguez (A.). **El achaparramiento del maíz** [Maize Stunt], pp. 34–39, 1 pl. A virus disease causing stunting of maize has recently been observed in Mexico, and its symptoms on various parts of the plant are described. It had previously been found to be transmitted by *Dalbulus* (*Baldulus*) *maidis* (DeL. & Wolc.), and an account is given of investigations in 1949 showing that *D.* (*B.*) *elimatus* (Ball), which is more widely distributed than *D. maidis*, is also a vector, the Jassid transmitting the virus from diseased to healthy maize after an incubation period of at least 21 days in the insect. The virus presumably overwinters in the vector.

Rodríguez (A.) & Cervantes (J.). **Efecto de la fecha de inoculación en los síntomas del achaparramiento del maíz** [Effect of Date of Inoculation on the Symptoms of Maize Stunt], pp. 39–41. In experiments in Mexico in 1950, maize was sown on 20th April and infested on six dates between 2nd May and 17th July with adults of *Dalbulus* (*Baldulus*) *elimatus* (Ball) that had fed on plants infected with maize stunt and had been kept long enough for incubation of the virus. The insects were removed after 48 hours, and observations on 15th August showed that reduction in growth varied with the earliness of infestation, plants infested on the first date showing 50 per cent. reduction in height and those infested on the last being unaffected.

Hernández O. (J.). **Biología del** *Baldulus elimatus* (**Ball.**) [The Bionomics of *Dalbulus elimatus*], pp. 41–42, 1 pl. Investigations on the bionomics of *Dalbulus* (*Baldulus*) *elimatus* (Ball) on maize in cages in Mexico in 1949–50 showed that the preoviposition period of this Jassid lasted about five days, and the egg and nymphal stages about 15 and 26 days, respectively.

Hernández (R.) & Aburto (S.). **Estudios sobre la biología de las especies** *Nicentrus testaceipes* (**Champ.**) **y** *Geraeus* **spp. en Chapingo, México** [Studies on the Bionomics of *N. testaceipes* and *Geraeus* spp. in Chapingo], pp. 42–46, 1 pl. Maize in Mexico is attacked by the weevils, *Geraeus* spp. and *Nicentrus testaceipes* Champ. Observations on the bionomics of the latter, all stages of which are briefly described, showed that the adults began to emerge in early May and fed on the shoots. The females oviposited after 8–15 days, laying up to 228 eggs each in the tender plant tissues, and the larvae hatched in an average of 10–11 days and fed

on the young leaves surrounding the whorl and then in the central shoot. Larvae were first seen in the field in late August and became full-fed in late September and early October. They overwintered in the soil and pupated in late March.

Pacheco M. (F.). **Fluctuaciones de las poblaciones de insectos que atacaron al maíz y al frijol en Progreso, Mor., en 1949–1950** [Fluctuations in the Populations of Insects that attacked Maize and Beans in Progreso in 1949–50], pp. 46–51, 2 graphs. Maize and beans were sown at fortnightly intervals at Progreso, Mexico, in 1949–50 and subsequently examined for infestation by insects, with a view to studying population fluctuations in the latter. The results are shown on graphs. The main species found on the maize were *Laphygma frugiperda* (S. & A.), *Thrips tabaci* Lind., *Dalbulus* (*Baldulus*) spp. (the vectors of stunt disease), *Aphis maidis* Fitch, and weevils (*Geraeus* spp. and *Nicentrus testaceipes* Champ.), and they were most numerous in October, December and April, August, October, and September, respectively. The weevils were not common. Those found on the beans were *Empoasca fabae* (Harris), *Thrips* sp., *Epilachna varivestis* Muls. and Chrysomeloids, and they were commonest in August and March, April, August, and August, respectively.

Guevara Calderón (J.). **Nuevas nitroparafinas clorinadas como insecticidas contra la chicharrita de la papa,** *Empoasca fabae* **(Harris)** [New chlorinated Nitroparaffins as Insecticides against the Potato Leafhopper, *E. fabae*], pp. 118–126, 1 graph, 8 refs. Details are given of experiments in Ohio in which dusts of 1 or 2 per cent. CS674A [1,1-bis(p-chlorophenyl)-2-nitrobutane] or 5 per cent. DDT proved very effective against nymphs of *Empoasca fabae* (Harris) on potato and beans and superior to some other dusts and sprays. At an equal concentration (2 per cent.) in the insectary, CS674A was rather more rapid in action than DDT, but both gave complete or almost complete mortality in 16 hours.

Enkerlin (D.). **El picudo del ejote,** *Apion godmani* **Wagn., su importancia económica y experimentos para su control en el Estado de Michoacán, México** [*A. godmani*, its economic Importance and Experiments on its Control in the State of Michoacán, Mexico], pp. 126–130. *Apion godmani* Wagner is an important pest of beans in Michoacán. The author describes its habits and the damage caused to the pods [*cf. R.A.E.*, A **41** 424] and gives an account of tests on its control by means of dusts applied fortnightly in 1950. The greatest reductions in infestation of the pods were given by 1 per cent. parathion [*cf. loc. cit.*], which proved more effective than 3 per cent. DDT or p,p′methoxy-DDT (methoxychlor); 33 per cent. cryolite and 1 per cent. rotenone each gave small reductions in some plots and none in others.

Enkerlin (D.). **Experimentos acerca del control de la conchuela del frijol,** *Epilachna varivestis* **Muls., en el Estado de Michoacán, México** [Experiments on the Control of *E. varivestis* in the State of Michoacán, Mexico], pp. 131–135. In tests against *Epilachna varivestis* Muls. on beans in Michoacán in 1950, in which various dusts were applied twice to heavily infested plants, 1 per cent. parathion or rotenone gave almost complete control ten days after the second application, whereas dusts of 33 per cent. cryolite or 3 per cent. DDT or p,p′methoxy-DDT (methoxychlor) were less effective.

Aburto M. (S.). **Experimentos para el control de la chicharrita del frijol,** *Empoasca fabae* **(Harr.), en Progreso, Morelos, México** [Experiments on the Control of *E. fabae* in Progreso, Morelos, Mexico], pp. 135–137. In tests against *Empoasca fabae* (Harris) on beans in Morelos in 1949–50, various dusts were applied 3–4 times per season, as required by the level of infestation, and their effectiveness was measured by the increase in yield

obtained. Where four applications were required, this was greatest for 3 per cent. p,p′methoxy-DDT (methoxychlor), which more than tripled the yield, and slightly less great for 3 per cent. toxaphene or DDT or 1 per cent. parathion or BHC; 1 per cent. rotenone doubled the yield only. Where only three applications were needed, methoxy-DDT almost doubled the yield and was more effective than 3 per cent. DDT, toxaphene or chlordane or 1 per cent. EPN [ethyl p-nitrophenyl thionobenzenephosphonate], Aramite [2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite] or dieldrin, but all these gave considerable increases.

Cortés Iturbe (A.). **La distribución del picudo del ejote,** *Apion godmani* **(Wagner), en México** [The Distribution of *A. godmani* in Mexico], pp. 137–142, 3 maps. Maps similar to those in a paper already noticed [**41** 424] are given showing the distribution of *Apion godmani* Wagner on beans in Mexico in the three years 1947–49 and the intensity of infestation by it. Infestation is greatest in damp valleys, such as those of Michoacán, and low on the arid plains of the centre and north.

Cortés Iturbe (A.). **El minador de la hoja,** *Chalepus signaticollis* **Baly y la chicharrita,** *Empoasca fabae* **(Harr.), como plagas del frijol en la región de Puebla, México** [*C. signaticollis* and *E. fabae* as Pests of Beans in the Puebla Region], pp. 142–145, 1 pl. Improved varieties of beans sown in the States of Puebla and Tlaxcala, Mexico, were seriously damaged by *Empoasca fabae* (Harris) and the Hispid, *Chalepus signaticollis* Baly. The eggs of the latter are laid in the lower surfaces of the leaves, and the larvae feed in the leaf, forming a cavity. They pupate in these mines. The adults feed on the leaves and buds, but are less injurious than the larvae. Laboratory tests showed that a deposit of a 3 per cent. DDT dust killed the adults rapidly, and when this dust was applied twice to infested plants in the field at an interval of 15 days in 1950, it gave good control of both insects.

Aburto M. (S.). **Experimentos efectuados para el control de** *Dicyphus minimus* **(Uhl.) la chinche del jitomate, en Morelos** [Experiments on the Control of *D. minimus*, the Tomato Bug, in Morelos], pp. 146–149. The Mirid, *Dicyphus minimus* Uhl., causes great damage to tomato in Morelos, Mexico, and is most numerous in April–June. The nymphs feed on the lower surfaces of the leaves, chiefly the young ones, and the adults on the whole plant. In a control experiment in August–October 1949, sprays were applied five times, as required by the level of infestation, and counts of the insects present were made a few days after each treatment. The average numbers per plant for the whole experiment were 0 for 1 per cent. parathion, 0·1 for 3 per cent. toxaphene or chlordane, 0·6 for 3 per cent. DDT and 2·2 for 3 per cent. p,p′methoxy-DDT (methoxychlor), as compared with 69·5 for no treatment. All treatments increased the yield, DDT and toxaphene tripling it.

Félix Estrada (R.). **Datos sobre el ciclo biológico del** *Dicyphus minimus* **(Uhl.)** [Data on the biological Cycle of *D. minimus*], pp. 149–154, 1 pl. *Dicyphus minimus* Uhl. is injurious to tomato and tobacco in Morelos, and in their absence feeds on other plants; adults were observed on *Solanum rostratum*, a common weed. Observations on the bionomics of the Mirid were carried out at temperatures ranging from maxima of 30–35 to minima of 15–20°C. [86–95 to 59–68°F.]. The eggs were inserted into the stems, petioles and lower surfaces of the leaves, eight females laying a total of 66 eggs in eight days in tomato, and four laying 89 in nine days in tobacco, and the nymphs hatched in 13–15 days on tomato. They fed on the lower leaf surfaces and gave rise to adults after 18–26 days. Adult males and females lived for averages of 46 and 53 days, respectively, when pairing took place and for 65 and 76 when it did not. Attack by successive generations kills the plant.

Cortés P. (R.). **Plagas entomológicas de la fruticultura en Chile** [Insect Pests of Fruit Cultivation in Chile], pp. 169–178, 5 refs. The author briefly reviews natural barriers to the introduction of insects into Chile, national legislation designed to exclude harmful species, and the results of work on biological control there, and gives lists of 114 species of insects that are pests of various fruits or other crops or stored products in Chile, showing which are indigenous and the fruits or other food attacked.

Carbonell (C. S.). **Ensayo de emulsiones de aceite mineral contra la cochinilla roja australiana,** *Aonidiella aurantii* **(Maskell), en el Uruguay** [A Test with Mineral-oil Emulsions against *A. aurantii* in Uruguay], pp. 178–204, 3 figs., 20 refs. *Aonidiella aurantii* (Mask.) recently appeared in north-western Uruguay and spread rapidly on *Citrus*, an important crop in the region. It is thought to have been introduced from Argentina, where it has been known for many years. Since the sprays applied by growers against the Coccids already present appeared ineffective against it and fumigation with hydrogen cyanide is impracticable under local conditions, various oil emulsions, with or without additional toxicants, were tested for its control on lemon, the trees being sprayed on 16th June or 14th August. Of the emulsions without additional toxicant, the most effective was 2·5 per cent. of a mayonnaise stock containing 80 per cent. oil with a viscosity of 75 secs. Saybolt at 100°F. and 90 per cent. unsulphonatable residue, which gave almost perfect control. The addition of 0·018 per cent. parathion to one of the other oils increased its effectiveness, as also, to a less extent did derris extract.

Blackaller Valdés (A.). **Pruebas preliminares de insecticidas para el control del frailecillo** *Macrodactylus mexicanus* **y** *M. subspinosus*, **realizadas en Chapingo, México** [Preliminary Tests of Insecticides for the Control of *M. mexicanus* and *M. subspinosus* carried out in Chapingo, Mexico], pp. 204–210. Adults of the Melolonthids, *Macrodactylus mexicanus* Burm. and *M. subspinosus* (F.), are injurious to fruit trees and other plants in various parts of Mexico. The eggs are laid in the soil, and the larvae feed on the roots of grasses and weeds, overwinter, and pupate in May, the adults emerging at the end of that month. Several insecticides were tested in sprays against the adults on the trees in 1949, and it was found that a 50 per cent. BHC wettable powder gave 100 and 99 per cent. mortality at 0·6 and 0·4 per cent., respectively, E 605 f [an emulsion concentrate containing 70 per cent. parathion] 100 and 99 per cent. at 1 and 0·8 per cent., and a 45 per cent. chlordane emulsion concentrate 85 and 80 per cent. at 0·1 and 0·08 per cent., whereas DDT and p,p′methoxy-DDT were ineffective. BHC was very rapid in action, and a concentration of 0·5 per cent. of the powder is recommended since 0·6 per cent. slightly scorched the foliage. Two applications, 25–30 days apart, should give complete protection.

Plummer (C. C.). **Estudios adicionales sobre DDT para el control de la mosca prieta de los cítricos** [Additional Studies on DDT for the Control of *Aleurocanthus woglumi* on *Citrus*], pp. 211–224, 8 refs. An account is given of tests in Mexico, some of which have already been noticed, leading to the adoption of a spray of 28 oz. DDT, 2 U.S. quarts each of xylene and kerosene and 4 oz. blood-albumin spreader per 100 U.S. gals. as a standard for the control of *Aleurocanthus woglumi* Ashby on *Citrus* [*cf. R.A.E.*, A **39** 234, etc.]. In modifications of this, the substitution of 4 quarts of the solution of DDT in xylene and kerosene per 100 gals. for the 4·5 quarts used in the standard formula did not decrease control, and the substitution of 2 U.S. quarts light-medium spray oil containing 7·5 oz. cubé (5 per cent. rotenone) for the kerosene did not improve it. DDT residues on the leaves of lemon sprayed 11 and 12 times in one year with the standard formula averaged 17·1

and 8·3 mmg. per sq. cm. six months after the last application. Soil residues to a depth of 8 ins. beneath sprayed trees averaged 14 parts per million after three applications and 46 p.p.m. after 12 applications in one year. In a slightly warmer locality, leaf residues averaged 0·61 mmg. per sq. cm. 5½ months after one treatment with the standard or reduced formula and 0·78 mmg. for that in which oil and cubé was substituted for kerosene. The standard formula caused serious injury to orange branches in some localities, but 12 monthly applications a year caused no damage to lemon in another.

Scaramuzza (L. C.). **El control biológico y sus resultados en la lucha contra el barrenador o perforador de la caña,** *Diatraea saccharalis* **(Fabr.) en Cuba, por medio de la mosca** *Lixophaga diatraeae* **(Towns.)** [Biological Control and its Results against the Sugar-cane Borer, *D. saccharalis*, in Cuba by means of the Fly, *L. diatraeae*], pp. 282–292, 14 refs. The larviparous Tachinid, *Lixophaga diatraeae* (Tns.), is the most important of the native parasites of *Diatraea saccharalis* (F.) on sugar-cane in Cuba and has been introduced from there into numerous countries. Its bionomics are reviewed [*R.A.E.*, A **19** 214], and an account is given of a method by which it has been reared in special laboratories in Cuba since 1945–46 for release in a control campaign. Puparia are obtained from field material after the cane is cut, and the larvae are dissected from females fertilised 8–9 days previously and placed on larvae of *D. saccharalis*, 1–4 per host, which are confined with pieces of maize stalk. The adults are released in cane fields 4–5 days after pairing, at about 1–2 females per acre. Numbers rising from nearly 16,000 in 1945 to over 58,000 in 1949 were released in June–October in the fields of the company concerned. The percentage infestation of the canes was not known in 1945, but it fell from 15·4 in 1946 to 1·8 in 1950.

Scaramuzza (L. C.). **Relación de los insectos y otros animales que atacan a la caña de azúcar en Cuba** [Lists of the Insects and other Animals that attack Sugar-cane in Cuba], pp. 292–302, 4 refs. Lists are given of upwards of 70 species of insects, two mites and a few other invertebrates and vertebrates that attack sugar-cane in Cuba, showing which are of economic importance, the natural enemies and hyperparasites of some of the insects, and the ants associated with some of the Homoptera.

Flores Cáceres (S.). **Plagas y enfermedades de la caña de azúcar en algunos ingenios de la República Mexicana** [Pests and Diseases of Sugar-cane in some Plantations of the Mexican Republic], pp. 302–324. Pests and diseases cause considerable loss of sugar-cane in Mexico, and notes are given on those found during a recent inspection of plantations. Of the pests, the most important were moth-borers; *Diatraea saccharalis* (F.) and *D. magnifactella* Dyar are present in the Gulf area and *D. grandiosella* Dyar, *Chilo loftini* Dyar, and *D. magnifactella* have been recorded from the Pacific slopes. *Aeneolamia* (*Tomaspis*) *postica* (Wlk.) is of less importance and is being well controlled by dusting with a mixture of BHC and DDT in talc.

Carbonell (C. S.). **Ensayos de laboratorio comparando la acción tóxica del hexacloruro de benceno y el clordano sobre la langosta invasora,** *Schistocerca cancellata* **(Serville)** [Comparative Laboratory Tests on the toxic Action of BHC and Chlordane on *S. cancellata*], pp. 352–361, 10 refs. Swarms of *Schistocerca cancellata* (Serv.) occasionally enter Uruguay from northern Argentina and give rise to further generations locally. Dusts are mainly used for control, and BHC has recently replaced DNC for this purpose. In the laboratory experiments described, chlordane was compared with BHC containing 10 per cent. γ isomer against field-collected adults. When the locusts were treated and caged with treated plants, a 12 per cent. BHC dust and a spray of 0·6 per cent. of an emulsion concentrate containing 45 per cent. chlordane, 20 per cent. DDT and 35 per cent.

solvents and emulsifiers gave complete mortality in 24 hours, and a 5 per cent. chlordane dust in 48 at 15–30°C. [59–86°F.]. When untreated locusts were confined with treated plants in treated cages, a dust of 5 per cent. BHC and the chlordane dust and spray gave complete mortality in 48, 41 and 48 hours, respectively at 15–25°C. [77°F.] and in 72 hours at 15–33°C. [91·4°F.]. When the locusts were treated in the cages at 15–4°C. [39·2°F.], the chlordane spray killed all and the 5 per cent. BHC dust 93 per cent. in 62 hours, and in tests in which batches of 100 locusts were carefully dusted with 0·5 gm. insecticide and transferred to clean cages at 5–20°C. [41–68°F.], 5 and 12 per cent. BHC gave complete mortality in 72 and 48 hours, respectively, and 5 and 10 per cent. chlordane in 72; when the amount of insecticide was reduced to 0·2 gm. per 100 locusts, 6 and 12 per cent. BHC killed 60 and 86 per cent. in 120 hours, but mortality in the controls was 36 per cent. A field test indicated that BHC and chlordane gave equal mortality after a period, though BHC was the more effective initially. Locusts treated with chlordane rapidly ceased feeding, however, so that the slower mortality is not necessarily a disadvantage.

del Bosque Flores (R.) & Márquez Delgado (A.). **Nuevos insecticidas experimentados sobre** *Melanoplus mexicanus mexicanus* (**Saussure**), *Sphenarius purpurascens* (**Charpentier**), **y observaciones hechas en la campaña contra la langosta,** *Schistocerca paranensis* (**Burm.**) [New Insecticides tested against *M. m. mexicanus* and *Sphenarium purpurascens*, and Observations made during the Campaign against the Locust, *S. paranensis*], pp. 362–379. *Melanoplus mexicanus mexicanus* (Sauss.) and *Sphenarium purpurascens* Charp., the adults of which are described, are widely distributed and injurious to many crops in Mexico. Various sprays were tested against these grasshoppers in plot tests, examples being collected one hour after treatment and observed in the insectary for up to 24 hours. The materials that gave complete mortality in that time were aldrin (referred to as 118) at 0·6 or 0·8 per cent., with equal amounts of petrol, BHC (10 per cent. γ isomer) or chlordane at 0·8 per cent., a proprietary material containing toxaphene at 0·4–0·8 per cent., and parathion sprays containing 0·4–0·8 per cent. toxicant. The toxaphene product was the most rapid in action.

Schistocerca paranensis (Burm.) is also injurious in Mexico. All stages of this locust are described, and it is stated to have 1–2 generations a year, the egg and nymphal stages lasting 14–70 and 44–70 days respectively, and the adults living for 60–180 days. Control is based on co-operation between Mexico and Central American countries, and an international committee was set up in 1949. Control work has been carried out in several of the countries concerned, principally with sprays of BHC and chlordane against the young hoppers. BHC proved no less effective than chlordane and considerably cheaper. Special attention should be given to the regions in Nicaragua and Costa Rica whence swarms spread over the whole of the outbreak area [*cf. R.A.E.*, A **41** 215].

Guagliumi (P.). **Estudio preliminar sobre el escarabajo rinoceronte o "coco",** *Podischnus agenor* (**Oliv.**), **plaga de la caña de azúcar en Venezuela.** [A preliminary Study on the Rhinoceros Beetle, *P. agenor*, a Pest of Sugar-cane in Venezuela.]—*Bol. téc. Div. Ent. Minist. Agric. Venezuela* no.3, [3+] 48 pp., 7 pls., 10 refs., multigraph. [Caracas] 1951. (With a Summary in English.)

In view of the importance of *Podischnus agenor* (Ol.) as a pest of sugar-cane in northern Venezuela, the author describes all stages of this Dynastid,

reviews its distribution and gives an account of investigations on its bionomics carried out in 1948–50 [*cf. R.A.E.*, A **40** 389]. The damage is caused by the adults, which tunnel in the canes. Dead-hearts result when young canes are attacked, but this is of little importance, since new shoots are nearly always produced. Injury to mature jointed canes, however, causes considerable loss. Maize is also attacked. The adults usually appear in May–July, are active at night and remain hidden during the day. They were strongly attracted to light. The females laid their eggs singly in earthen cells in soil rich in humus. In the laboratory, the preoviposition period lasted about six days, the numbers of eggs per female averaged 22–27, and males and females lived for averages of 52·5 and 57·6 days, respectively. The larvae hatched in 9–25 days, and fed on decaying vegetable matter in the soil, only rarely attacking living tissues. Examples kept in soil of pH 6 with 10·49 per cent. organic content developed normally, the larval stage averaging 185 days, but those kept in soil of pH 7·8 with 3·9 per cent. organic matter all died in a few days if the soil was kept dry and were retarded in development if it was moist; under the moist conditions, mortality due to disease and cannibalism was high. Larvae in soil that was rich in humus but lacked sufficient moisture remained quiescent for several weeks in cells about a foot below the surface and died if favourable conditions were not restored. Larvae were normally present from the beginning of the rainy season in May–July until the middle of the dry season, in January–February. The prepupal stage averaged 26 days, and the pupal stage, which was passed in a cell 12–16 ins. below the surface, 30 days. Some of the adults remained in the soil until the following January or February, and these were lethargic, did not feed on the sugarcane or maize provided, and died in 6–8 weeks.

The only parasite so far found is the Scoliid, *Campsomeris servillei* (Guér.) (*hyalina* Lep.) [*cf. loc. cit.*], which attacks the larvae and appears to be specific to *P. agenor*. As control measures against the adults are impracticable, frequent surface and occasional subsoil ploughing in summer in fields where larvae are known to be present is recommended, in order to expose them to the heat and air and to attack by predators. Drainage of damp soils creates unfavourable conditions for development.

BERAN (F.). **Ein Beitrag zur Methodik der Insektizidprüfungen.** [A Contribution to the Method of testing Insecticides.]—*Pflanzenschutzberichte* **11** pt. 9–12 pp. 151–160, 2 figs., 6 refs. Vienna, 1953. (With a Summary in English.)

Musca domestica L. is frequently used as a test insect for the evaluation of contact insecticides, but comparison of the results obtained by different workers is difficult because of the diverse methods adopted. The two principal methods are exposure to a deposit, for a given period or until a given effect is produced, and topical application. A technique is described for the latter in which graduated series of concentrations are used and the flies are treated with 1-mml. droplets and then kept in perforated cellophane bags containing cotton-wool soaked in sugar solution. The bags are used once only, so that cleaning of containers is eliminated. The deposit method is the more usual and has sometimes been used for quantitative determinations, but these are valid only if an equal amount of toxicant is taken up by each insect. This was shown not to be the case in experiments in which batches of 25 female flies were placed in petri dishes containing deposits from a solution of 10 per cent. DDT in ether and others received for comparison topical applications of 0·4 mg. DDT in acetone. Mortality was

complete in both series after 24 hours and acetone extracts from the flies were tested on further flies. The resulting mortality percentages averaged 7–13 for the first series and 30–36 for the second. The difference in the first case was not significant, but it is too great for quantitative determination and would be even greater for batches containing both sexes, since topical application of 0·472 mmg. per fly to individuals averaging 12·2 mg. in weight caused 60 and 37 per cent. mortality of males and females, respectively. Further, mortality varies with the weight of the flies, topical applications of 1·062 mmg. per female resulting in 56, 64 and 86 per cent. mortality of flies with average weights of 15, 12 and 9·6 mg., respectively. Although these differences were considerable, the products of average weight and mortality percentage (840, 768 and 826) were remarkably constant, and the mortality can therefore be standardised to refer to a uniform average weight. When the results of the last test were transformed in this way for a fly weight of 12 mg., the mortality percentages were 70, 64 and 68, or an average of 67·3, as compared with the experimental average of 68·7. In tests with topical applications of 0·008 mmg. lindane [almost pure γ BHC], the similarly transformed percentages were 52 and 53·2 for flies weighing 250–280 and 190–210 mg. per batch of 25.

The results of tests of insecticides are best analysed by the construction of log-probit dosage-mortality curves that allow determination of the median lethal dose or that giving any other desired level of mortality. The method of doing this is illustrated from tests with DDT, and curves based on experiments with house-flies are given for aldrin, lindane, dieldrin, parathion, toxaphene and DDT, for which the median lethal doses in mmg. per gm. fly weight were 0·42, 0·73, 1·1, 1·56, 19·2 and 55, respectively.

Schreier (O.). **Über das Auftreten von Blattläusen an Kartoffelstauden in Niederösterreich im Jahre 1953.** [On the Occurrence of Aphids on Potato in Lower Austria in 1953.]—*Pflanzenschutzberichte* **11** pt. 9–12 pp. 161–175, 3 graphs, 16 refs. Vienna, 1953. (With a Summary in English.)

Observations on Aphids in connection with the raising of virus-free seed potatoes in Lower Austria were continued in 1953, when counts were made in the same areas as before [*cf. R.A.E.*, A **42** 178, etc.]. These showed that the specific composition of the Aphid population was much the same as in the previous year, though the number of localities in which *Myzus* (*Myzodes*) *persicae* (Sulz.) predominated over *Aphis* (*Doralis*) *rhamni* Boy. was somewhat greater. Infestation was early and was generally higher at the base of the plants than at the top, and though the percentage of infested leaves and the number of Aphids per 100 leaves generally increased together, there was no constant relation between the coefficients of increase. Aphid counts alone are therefore not a sufficient basis for estimating the probability of virus infection, particularly when infestation is light.

Bondesen (P.). **Wood-wasps producing short Circuits.**—*Ent. Medd.* **26** pt. 6 pp. 495–498, 3 figs., 6 refs. Copenhagen, 1953.

A short circuit that occurred in a stable near Randers, Denmark, in 1950 was found to have been due to perforation of an electric cable by an insect. On removal of the cable, which was unarmoured and attached to the deal boards with which the walls of the stable had been lined in 1948, the exit-hole of a wood-wasp was found. Other exit-holes were also present in the

boards, and the species responsible is believed from the dimensions of the holes and burrows to have been *Sirex* (*Paururus*) *juvencus* L. or possibly *Urocerus* (*S.*) *gigas* (L.) [*cf. R.A.E.*, A **10** 60]. After emerging from the wood, the insect had bored through insulation consisting of plaited paper strings saturated with pitch, lead sheathing 0·9 mm. thick, a paper covering containing three insulated wires and the paper covering and layer of rubber 0·6 mm. thick round two of the wires themselves.

Nijveldt (W.). **Galmuggen van cultuurgewassen. III. Galmuggen, schadelijk voor de boomteelt in Nederland.** [Gall-midges on cultivated Plants. III. Gall-midges injurious to Trees in Holland.]—*Tijdschr. PlZiekt.* **59** pt. 4 pp. 137–142, 12 figs., 5 refs. Wageningen, 1953. (With a Summary in English.)

This third part of a series [*cf. R.A.E.*, A **42** 239] is concerned with the Cecidomyiids that attack shade trees in Holland. The galls formed are described, and information on bionomics, distribution and food-plants is given, mainly from the literature. The species are *Dasyneura crataegi* (Winn.) on *Crataegus oxyacantha*, *Rhabdophaga* (*D.*) *marginemtorquens* (Bremi), *R. rosaria* (H.Lw.) and *R. terminalis* (H.Lw.) on *Salix* spp., and *Monarthropalpus buxi* (Lab.) on *Buxus sempervirens*. They seldom cause damage of economic importance.

Heqvist (K. J.). **Några iakttagelser vid en härjning av bleka tallstekeln** (*Diprion pallidum* **Klug**). [Observations during an Outbreak of *Gilpinia pallida*.]—*Svenska SkogsvFören. Tidskr.* **50** no. 2 pp. 221–230, 7 figs., 16 refs.; also as *Medd. SkogsforsknInst.* Ser. Uppsats. no. 23. Stockholm, 1952. (With a Summary in German.)

An outbreak of *Gilpinia* (*Diprion*) *pallida* (Klug), a sawfly that is seldom injurious, was observed on pines on an island in Lake Bottensjö, central Sweden, in 1946, following two years of abnormally high temperatures. Defoliation was severe. Cocoons were collected in September and observed for emergence in the following spring. The sawfly emerged from 2·4 per cent. of these, and the parasites, *Dahlbominus* (*Microplectron*) *fuscipennis* (Zett.), *Aptesis* (*Microcryptus*) *basizona* (Grav.), *Agrothereutes* (*Spilocryptus*) *abbreviator* (F.), and *Exenterus adspersus* Htg. from 14·8, 4·3, 3·3 and 0·5 per cent., respectively; a few adults of the hyperparasite, *Hemiteles areator* (Panz.), were also obtained. A further 1 per cent. were attacked by fungi, and no emergence occurred from the remainder. Inspection in 1947 showed that the outbreak had collapsed and that a few small trees had been killed by subsequent bark-beetle attack.

Neumark (S.). **The preservative Treatment of round** *Eucalyptus camaldulensis* (*E. rostrata*) **Poles in Israel by a modified Boucherie Process, its Laws and Application.**—*Ilanoth* 1953 no. 2 pp. 49–99 [+ 5], 26 figs., 29 refs. Ilanoth, 1953. (With a Summary in Hebrew.)

Eucalyptus camaldulensis (*rostrata*) is the main source of timber for agricultural purposes in Israel and could be used to provide poles for telephone and power transmission if these were not destroyed within three years of felling by various pests, of which the most important is the introduced

Phoracantha semipunctata (F.) [*cf. R.A.E.*, A **41** 230, etc.]. This Cerambycid is active from March to October and occasionally during the winter, attacks green poles within 24 hours of cutting, and causes complete and rapid destruction of cambium, phloem and inner bark, resulting in cracking and splitting of the wood. The only effective method of protection is impregnation immediately after felling, and a technique was developed for injecting an aqueous solution of zinc chloride into the sapwood under a pressure of five atmospheres by capping one end of the cut pole [*cf.* **34** 55]. At that pressure the speed of flow averaged 1 litre per 102 seconds in poles 6·5–20·3 ft. long and containing 0·4–4·3 cu. ft. of sapwood, and was little affected by the dimensions of the poles. *Phoracantha* larvae were found not to enter the bark or wood of poles containing 0·4 lb. zinc chloride per cu. ft. sapwood, and it was shown that poles containing 1 lb. per cu. ft. sapwood, which is considered the standard content, should have an average life of more than 22 years. Numerous experiments indicated that the speed and degree of impregnation were not affected by applying the solution to the top of the pole, which is smaller in diameter and hence easier to treat than the butt.

When the treatment is applied, the drip from the other end of the pole consists first of sap, pressed out by the solution, and then gradually increases in density until its specific gravity equals that of the treating solution. Until that point is reached, there is a mineral gradient in the pole, with its maximum at the treated end and its minimum at the far end, and its steepness varies with the difference between the concentrations of the treating solution and the drip. The amount of drip necessary for the gradient to be overcome diminishes with the concentration of the treating solution. Measuring the specific gravity of the drip proved to be a precise method of determining the mineral retention for different volumes of sapwood. The maximum retention from a treating solution of a certain concentration varies with the species of wood. *E. camaldulensis* retained 2·8–3 per cent. dry salt, equal to about 1 lb. per cu. ft. of sapwood, from a 3·8 per cent. solution of zinc chloride. No longitudinal diffusion, such as was found to occur in *Cupressus sempervirens*, took place in the poles once they had been treated, so that any mineral gradient established will remain. To save time in treatment, the gradient need not be completely overcome, and, in the technique finally adopted, fence posts and heavy poles are treated with 3·8 and 5·3 per cent. solutions, respectively, until the drip reaches five-sixths of the concentration of the treating solution; about two hours are required for the treatment of light telephone poles. Examination nine months after treatment indicated that the chemical not only protected the poles against insects and fungi but considerably reduced cracking and splitting of the wood.

Papers noticed by Title only.

Raizenne (H.). **Forest Lepidoptera of southern Ontario and their Parasites received and reared at the Ottawa Forest Insect Survey Laboratory from 1937 to 1948.**—[7 +] 277 pp., 1 map. Ottawa, Div. For. Biol., Dep. Agric. Can., 1952.

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